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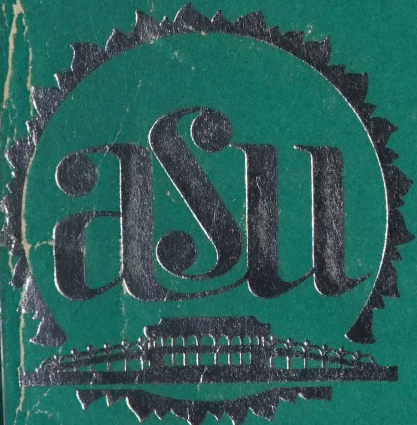

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MAR 1
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APR 29 1977
APR 8 1977

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ARIZONA STATE UNIVERSITY

General Catalog

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BUSINESS ADMINISTRATION
PAGE 135

EDUCATION
PAGE 149

ENGINEERING SCIENCES
PAGE 161

ARCHIT
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NURSING
PAGE 187

FINE ARTS
PAGE 19

LAW
PAGE 1

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REQUESTS FOR DETAILED INFORMATION SHOULD BE ADDRESSED AS FOLLOWS:

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ARIZONA STATE UNIVERSITY
TEMPE, ARIZONA 85281

BULLETIN • ARIZONA STATE UNIVERSITY • TEMPE, ARIZONA
VOLUME LXXX MAY, 1965 NUMBER 2
PUBLISHED QUARTERLY SECOND CLASS POSTAGE PAID AT TEMPE, ARIZONA 85281

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General Catalog

1965-----1966
1966-----1967

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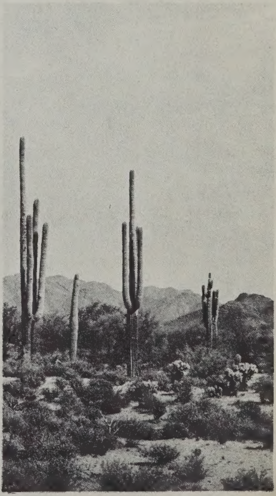
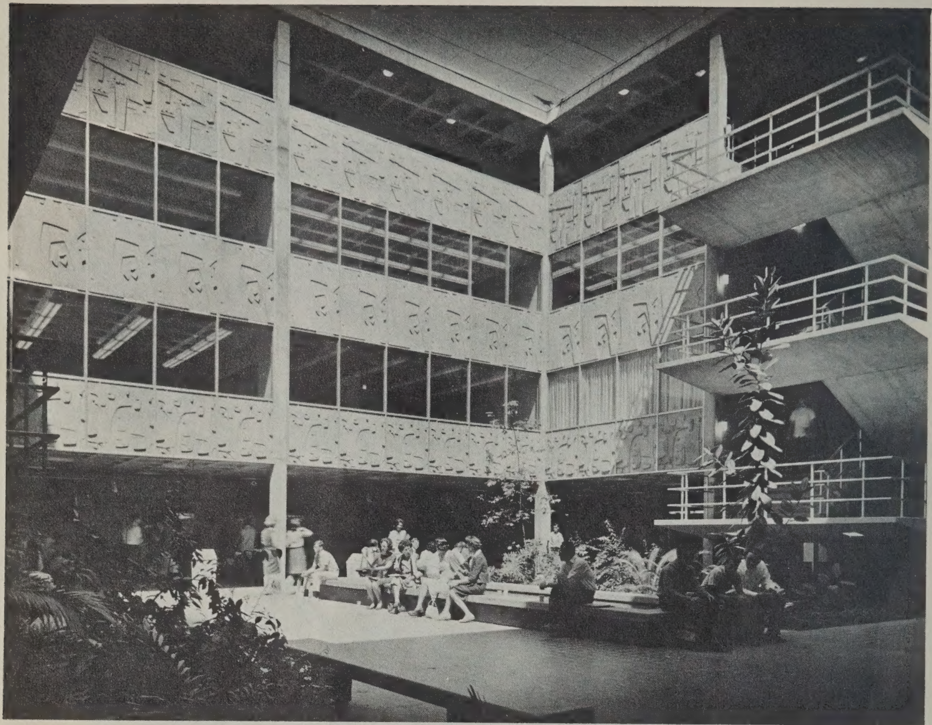
THE ARIZONA STATE

UNIVERSITY SETTING

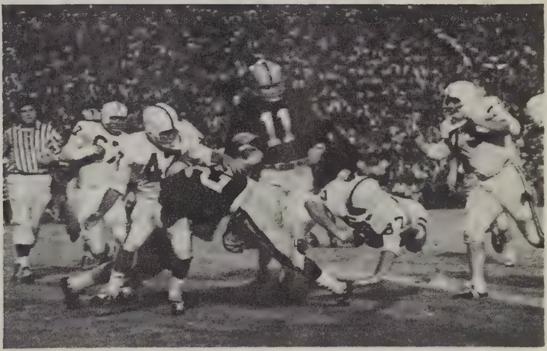
Arizona State University is in Tempe, near the heart of metropolitan Phoenix (shown above). Grady Gammage Memorial Auditorium, in foreground of aerial view of campus at upper left, is the cultural center for the University. Palm-lined walks provide a setting for modern buildings such as the Education Building (lower left) and Business Administration Building (lower right).

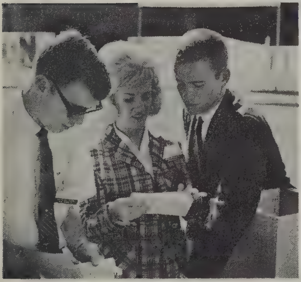


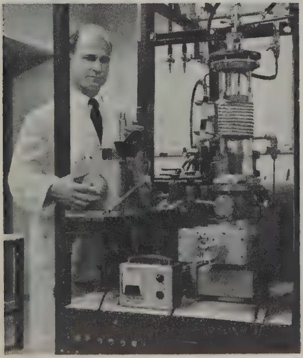


LITERATURE

Students enjoy a variety of academic and extra-curricular activities at Arizona State University. At left is the Social Sciences Building patio, and the new Language and Literature Building. At top right are the College of Fine Arts headquarters and Palo Verde residence halls.







The acoustical forms of the Grady Gammage Memorial Auditorium balconies emphasize Arizona State University's awareness of new ideas. The auditorium was designed by Frank Lloyd Wright. Below is the north wing of the Engineering Sciences complex.

CALENDAR

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UNIVERSITY CALENDAR

1965-66—1966-67

FALL SEMESTER

	1965-66	1966-67
Residence Halls and Dining Hall Open	Sept. 6, M.	Sept. 5, M.
First Freshman Assembly	Sept. 7, Tu.	Sept. 6, Tu.
Orientation and Guidance for Freshmen (All Freshmen are expected to be in attendance on these days for the special orientation programs and aptitude tests.)	Sept. 7, 8, 9, 10, 11. Tu., W., Th., F., Sa.	Sept. 6, 7, 8, 9, 10, Tu., W., Th., F., Sa.
Freshman Students Will Complete Registration and Pay Fees	Sept. 9, Th.	Sept. 8, Th.
Sophomores, Juniors, Seniors and Graduates Receive Registration Materials	Sept. 9, Th.	Sept. 8, Th.
Sophomores, Juniors, Seniors and Graduates Complete Registration	Sept. 10, 11, F., to Noon Sa.	Sept. 9, 10, F., to Noon Sa.
Instruction Begins	Sept. 13, M.	Sept. 12, M.
Last Day of Registration for Credit	Sept. 20, M. 4:00 p.m.	Sept. 19, M., 4:00 p.m.
Last Day Courses May Be Dropped Without Penalty	Oct. 22, F., 4:00 p.m.	Oct. 21, F., 4:00 p.m.
Mid-semester Scholarship Reports Due	Nov. 5, F. 4:00 p.m.	Nov. 4, F., 4:00 p.m.
Veterans' Day, No Classes	Nov. 11, Th.	Nov. 11, F.
Candidates for Bachelor's Degrees Must File Application for Graduation by	Nov. 15, M.	Nov. 14, M.
Thanksgiving Recess, Classes Excused	Nov. 25, Th., through Nov. 28, Su.	Nov. 24, Th., through Nov. 27, Su.
Christmas Vacation, Classes Excused	Dec. 20, M., through Jan. 2, Su.	Dec. 19, M., through Jan. 1, Su.
Final Examinations	Jan. 18, 19, 20, 21, 22, 24, Tu., W., Th., F., Sa., M.	Jan. 17, 18, 19, 20, 21, 23, Tu., W., Th., F., Sa, M.
First Semester Grade Reports Due	Jan. 25, Tu., 4:00 p.m.	Jan. 24, Tu., 4:00 p.m.

SPRING SEMESTER

	1965-66	1966-67
Residence Halls Open to New Students	Jan. 23, Su.	Jan. 22, Su.
New Freshmen and Transfer Students Take Aptitude Examinations	Jan. 25, Tu.	Jan. 24, Tu.
Registration Days (All students will complete registration and pay fees.)	Jan. 26, 27, 28, 29, W., Th., F., Sa., to Noon	Jan. 25, 26, 27, 28, W., Th., F., Sa., to Noon
Instruction Begins Second Semester	Jan. 31, M.	Jan. 30, M.
Last Day of Registration for Credit	Feb. 7, M.	Feb. 6, M.
Washington's Birthday	Feb. 22, Tu.	Feb. 22, W.
Last Day Courses May be Dropped Without Penalty	Mar. 11, F., 4:00 p.m.	Mar. 10, F., 4:00 p.m.
Charter Day Convocation	Mar. 11, F.	Mar. 13, M.
Mid-semester Scholarship Reports Due	Mar. 25, F., 4:00 p.m.	Mar. 22, W., 4:00 p.m.
Easter Vacation	Apr. 6, W., through Apr. 11, M.	Mar. 23, Th., through Mar. 28, Tu.
Commencement Rehearsal (Sun Devil Stadium)	May 20, F., 8:00 a.m.	May 19, F., 8:00 a.m.
Final Examinations	May 21, 23, 24, 25, 26, 27, Sa., M., Tu., W., Th., Fr.	May 20, 22, 23, 24, 25, 26, Sa., M., Tu., W. Th., F.
Baccalaureate Service	May 22, Su., 8:00 p.m.	May 21, Su., 8:00 p.m.
Commencement Exercises	May 27, Fri., 8:00 p.m.	May 26, Fri., 8:00 p.m.
Second Semester Grade Reports Due	May 31, Tu., 12:00 Noon	May 29, M., 12:00 Noon
Residence Halls Closed	May 28, S., 12:00 Noon	May 27, S., 12:00 Noon

SUMMER SESSIONS

	1965-66	1966-67
First Summer Session Begins Registration	June 13	June 12
First Summer Session Ends	July 16	July 15
Second Summer Session Begins Registration	July 18	July 17
Second Summer Session Ends	Aug. 20	Aug. 19

BOARD OF REGENTS AND UNIVERSITY OFFICERS

ARIZONA BOARD OF REGENTS

Ex Officio

Samuel P. Goddard, A.B., LL.B.	Governor of Arizona
Sarah Folsom, B.A., M.A.	State Superintendent of Public Instruction

Appointed

	Term Expires
O. D. Miller, A.B., President	January, 1967
Vivian L. Boysen, B.A., M.A., Treasurer	January, 1967
George Chambers, Secretary	January, 1969
Leon Levy, Assistant Treasurer	January, 1969
Arthur B. Schellenberg, B.S. in Ch.E., Assistant Secretary	January, 1971
W. P. Goss, B.S. in Min.E.	January, 1971
Elwood W. Bradford, B.S.	January, 1973
Norman G. Sharber	January, 1973

James Byron McCormick, S.J.D., LL.D	Adviser to the Board
Myron R. Holbert, A.B., M.A.	Budget Officer for Board
Alvred B. Nettleton, M.S., C.P.A.	General Examiner for Board

ARIZONA STATE UNIVERSITY

G. Homer Durham, Ph.D.	President of the University
Gordon B. Castle, Ph.D.	Vice President
Joseph C. Schabacker, Ph.D.	Academic Vice President
William J. Burke, Ph.D.	Vice President for Research
Gilbert L. Cady, B.A. in Ed.	Vice President for Business Affairs

THE FACULTY, UNIVERSITY OFFICES AND SERVICES

GENERAL ADMINISTRATION

G. Homer Durham (1960)* ... President of the University; Professor of Political Science
B.A., University of Utah; Ph.D., University of California, Los Angeles

Gordon B. Castle (1962) ... Vice President; Professor of Zoology
B.A., Wabash College; M.A., Ph.D., University of California, Berkeley

Joseph C. Schabacker (1963) ... Academic Vice President; Professor of Management
B.S., Temple University; M.B.A., Ph.D., University of California, Los Angeles

William J. Burke (1962) ... Vice President for Research; Dean, Graduate College; Professor of Chemistry
A.B., Ohio University; Ph.D., Ohio State University

Gilbert L. Cady (1934) ... Vice President for Business Affairs
B.A. in Ed., Arizona State University

T. Tilman Crance (1941) ... Assistant to the President for Budget and Institutional Studies
B.A. in Ed., M.A. in Ed., Arizona State University; C.P.A., Arizona

Karl H. Dannenfeldt (1956) ... Dean, College of Liberal Arts; Professor of History
A.B., Valparaiso University; M.A., Indiana University; Ph.D., University of Chicago

James W. Elmore (1949) ... Dean, College of Architecture; Professor of Architecture
A.B., University of Nebraska; M.S. in Arch., Columbia University

Glenn D. Overman (1956) ... Dean, College of Business Administration Professor of General Business Administration
B.S., Central State College; M.S., Oklahoma State University; D.B.A., Indiana University

G. D. McGrath (1950) ... Dean, College of Education; Professor of Education
A.B., Findlay College; M.A., University of Michigan; Ph.D., University of Colorado

Lee P. Thompson (1955) ... Dean, College of Engineering Sciences; Director, School of Engineering; Professor of Engineering
B.A., Indiana University; M.S., Ph.D., Agricultural and Mechanical College of Texas

Henry A. Bruinsma (1964) ... Dean, College of Fine Arts; Chairman, Department of Music; Professor of Music
B.M., M.M., Ph.D., University of Michigan

Horace W. Lundberg (1962) ... Dean, Graduate School of Social Service Administration; Professor of Social Work
B.S., Utah State University; M.S., University of Utah; M.S.W., University of California, Berkeley; Ph.D., University of Minnesota

Loretta A. Hanner (1957) ... Dean, College of Nursing; Professor of Nursing
R.N., Michael Reese Hospital School of Nursing; P.H.N., B.S., University of Minnesota; M.S., Cornell University

Roy C. Rice (1946) ... Dean of Summer Session and Extension; Professor of Education
B.S., University of New Mexico; M.S., University of Massachusetts; Ph.D., University of Texas

W. P. Shofstall (1950) ... Dean of Students; Director of Student Activities; Professor of Education
B.S. in Ed., Northeast Missouri State Teachers College; M.A., Ph.D., University of Missouri

---

*Year of first appointment to the faculty

Catherine G. Nichols (1952) .... Associate Dean of Students;
Professor of Education
A.B., M.A., University of Kentucky; Ed.D., Teachers College, Columbia University

George F. Hamm (1962) .... Dean of Men; Assistant Professor of Education
B.S., South Dakota State College; M.A., Ph.D., University of Wyoming

Alan D. Covey (1962) .... University Librarian
A.B., Certificate in L.S., University of California, Berkeley;
Ed.D., Stanford University

Alfred Thomas, Jr. (1939) .... Registrar and Director of Admissions
B.A. in Ed., M.A. in Ed., Arizona State University

Cecelia Scoular (1955) .... Director, Memorial Union
B.A., Lawrence College; M.A., Teachers College, Columbia University

Robert F. Menke (1947) .... Director of Placement Center;
Professor of Education
B.S., Oshkosh State College; M.A. in Ed., Ph.D., Northwestern University

Charles E. LaDue (1959) .... Comptroller
B.S., M.S., Arizona State University

George A. Boyd (1955) .... Associate Director, Laboratory for Meteoritic Research
A.B., M.A., Austin College; M.S., University of Iowa

Mary L. Bunte (1933) .... Administrative Secretary, President's Office
A.B. in Ed., Arizona State College; M.A. in Ed., Arizona State University

James W. Creasman (1947) .... Executive Secretary, Alumni Association
B.A. in Ed., Arizona State University

Joseph E. Spring (1954) .... Chief, News Bureau
A.B., Illinois Wesleyan University; M.A., Ph.D., University of Denver

Dean E. Smith (1950-52; 1959) ...... Director of Development and Publications
B.S., Arizona State University

Kathryn K. Gammage (1960) .... Assistant Director of Development
B.A., Heidelberg College; M.S. in Ed., Syracuse University

Clyde B. Smith (1952) .... Director of Intercollegiate Athletics;
Chairman, Department of Health, Physical Education and Recreation; Associate Professor of Health, Physical Education and Recreation.
A.B., Geneva College; M.S. in Ed., Indiana University

RESIDENT FACULTY

Abbott, John C. (1956) .... Associate Professor of Education
B.S., M.S. in Ed., Ed.D., Indiana University

Abraham, Willard (1953) .... Professor of Education;
Chairman, Department of Educational Services
B.S., Illinois Institute of Technology; M.Ed., Chicago Teachers College;
Ph.D., Northwestern University

Acevedo, Roberto M. (1964) .... Assistant Professor of Spanish
A.B., University of California, Berkeley; M.A., University of Arizona

Adams, Gayle E. (1963) .... Professor of Engineering
B.S.E.E., M.S.E.E., Ph.D., University of Wisconsin

Adams, James G., Capt. (1963) .... Assistant Professor of Military Science
B.S., Oregon State University

Adams, Kenneth H. (1964) .... Assistant Professor of Engineering
B.S.M.E., M.S.M.E., California Institute of Technology

Adams, Wallace E. (1958) .... Associate Professor of History
B.S., M.A., University of Oregon; Ph.D., Stanford University

Alisky, Marvin Howard (1957) .... Professor of Mass Communications;
Chairman, Department of Mass Communications
B.A., M.J., Ph.D., University of Texas

Allen, Theodore, Jr. (1959) .... Associate Professor of Engineering
B.S.M.E., M.S.M.E., Agricultural & Mechanical College of Texas

Al-Marayati, Abid A. (1965) .... Assistant Professor of Political Science
B.A., M.A., Bradley University; Ph.D., New York University

Antoine, Josephine L. (1959) .... Professor of Music
B.A., M.M., University of Colorado

ARCHER, JEROME W. (1963) .... Professor of English; Chairman, Department of English
B.A., M.A., Marquette University; Ph.D., Northwestern University

ARNER, DOUGLAS G. (1959) .... Professor of Philosophy
B.S., Creighton University; M.A., Ph.D., University of Michigan

ARONSON, JOHN N. (1959) .... Associate Professor of Chemistry
B.A., Rice University; M.S., Ph.D., University of Wisconsin

ASHE, ROBERT W. (1955) .... Professor of Education
A.B., M.A. in Ed., Arizona State University; Ed.D., University of Southern California

AUTENRIETH, BERTHA (1946) .... Associate Professor of Music
B.M., New England Conservatory; M.M., University of Michigan

AUTORE, DONALD D. (1959) .... Assistant Professor of Engineering
B.S.E., University of Michigan; M.S., Arizona State University

AVERY, JAMES P. (1960) .... Associate Professor of Engineering
B.S.E., M.S.E., University of Michigan; Ph.D., Purdue University

AX, LELAND S. (1959) .... Associate Professor of Engineering
B.S.E.E., B.S.R.E., Tri-State College; M.S., Kansas State College

BACHRACH, ARTHUR JULIAN (1962) .... Professor of Psychology; Chairman, Department of Psychology
B.S., College of the City of New York; M.A., Western Reserve University; Ph.D., University of Virginia

BAGLEY, WELDON D. (1961) .... Instructor in Industrial Technology
B.S., Utah State University

BAGWELL, MARILYN G. (1962) .... Instructor in Nursing
B.S., University of California, Los Angeles

BAKER, DONALD H. (1965) .... Instructor in Health, Physical Education and Recreation; Assistant Football Coach
B.S., M.A., North Texas State University

BAKER, ROBERT L. (1956) .... Professor of Education
B.S., M.A., Ph.D., University of Nebraska

BALL, RACHEL STUTSMAN (1947) .... Professor Emeritus of Psychology
A.B., University of Missouri; Ph.D., University of Chicago

BARDRICK, RICHARD A. (1956) .... Associate Professor of Psychology
A.B., Ph.D., University of California, Los Angeles

BARKLEY, MARGARET V. (1963) .... Associate Professor of Home Economics; Supervisor for State Department of Education
B.S., Millikin University; M.S., Ed.D., University of Illinois

BARKSON, JOSEPH A. (1958) .... Professor of Engineering
B.S.E.E., University of Michigan; M.S., Ph.D., University of Illinois

BARLOW, RICHARD B. (1965) .... Associate Professor of History
B.A., M.A., Ph.D., University of Pennsylvania

BAROODY, WILSON GEORGE (1957) .... Assistant Professor of English
B.A., Grand Canyon College; M.A., University of Arizona

BARRETT, THOMAS W. (1950) .... Professor of Agronomy
B.S., Brigham Young University; M.S., Ph.D., Cornell University

BARTL, CHARLES P. (1963) .... Associate Professor of Education
A.B., M.A., Sacramento State College; Ph.D., University of Denver

BATCHELOR, HAROLD W. (1943) .... Professor of Library Science; Chairman, Department of Library Science
B.A., University of Oregon; B.S. in L.S., M.S., University of Illinois

BATEMAN, GEORGE M. (1927) .... Professor of Chemistry
B.S., Utah State University; M.S., Ph.D., Cornell University

BATES, F. KATHLEEN (1964) .... Assistant Professor of Home Economics
B.S., State University of New York; M.S., Drexel Institute of Technology

BATY, WAYNE M. (1962) .... Associate Professor of General Business Administration
B.S. in Ed., Southwest Missouri State College; M.A., Northwestern University; Ph.D., University of Southern California

BAUMANN, VICTOR HUGH (1964) .... Associate Professor of Education
B.A., Grinnell College; M.A., Northwestern University; Ed.D., University of Southern California

BEAKLEY, GEORGE C., JR. (1956) .... Professor of Engineering; Assistant Dean, College of Engineering Sciences; Chairman, Mechanical Engineering Faculty
B.S.M.E., Texas Technological College; M.S.M.E., University of Texas; Ph.D., Oklahoma State University

Becker, Walter G. (1955) .... Associate Professor of General Business Administration
A.B., M.A., Loyola University; Ph.D., State University of Iowa

Bedient, Jack D. (1963) .... Assistant Professor of Mathematics
A.B., Albion College; M.B.S., University of Colorado

Bedworth, David D. (1963) .... Associate Professor of Engineering
B.S. in I.E., Lamar College of Technology; M.S. in I.E., Ph.D., Purdue University

Belok, Michael V. (1959) .... Associate Professor of Education
B.S., Indiana University; M.A., Arizona State University;
Ph.D., University of Southern California

Bender, Gordon L. (1953) .... Professor of Zoology
B.S., Iowa State College; M.S., University of Wisconsin;
Ph.D., University of Illinois

Benedict, Joel A. (1946) .... Professor of Education; Director, Audiovisual Center
B.A., M.A., Arizona State University; Ed.D., Stanford University

Berman, Neil S. (1964) .... Assistant Professor of Engineering
B.S., University of Wisconsin; M.S., M.A., Ph.D., University of Texas

Berney, Robert E. (1964) .... Assistant Professor of Economics
B.A., M.A., Washington State University; M.S., Ph.D., University of Wisconsin

Bertelsen, Wendle R. (1964) .... Instructor in Architecture
B.Arch., University of Michigan

Bertke, Eldridge M. (1958) .... Associate Professor of Zoology
B.S., M.S., Ph.D., University of Wisconsin

Betz, Mathew Joseph, III (1961) .... Associate Professor of Engineering
B.S., M.Sc., Ph.D., Northwestern University

Bieber, Allan LeRoy (1963) .... Assistant Professor of Chemistry
B.S., M.S., North Dakota State University; Ph.D., Oregon State University

Bininger, Robert J. (1962) .... Associate Professor of Spanish
B.A., Ph.D., Ohio State University

Blackham, Garth (1962) .... Associate Professor of Education
B.S., M.S., Utah State University; Ph.D., Cornell University

Blewett, Laura Jean (1964) .... Instructor in Nursing
B.S., University of Minnesota; M.S., Western Reserve University

Bloyer, Russell O. (1964) .... Instructor in Education; Assistant Dean of Men
B.S., Bemidji State College; M.A., Colorado State College

Board, Cornelius Z. (1955) .... Assistant Professor of Industrial Technology
B.S., M.A. in Ed., Arizona State University

Boetto, Laurel B. (1956) .... Assistant Professor of Education
B.A. in Ed., M.A. in Ed., Arizona State University

Bohlman, Herbert M. (1964) .... Assistant Professor of General Business Administration
B.S. in B.A., Drake University; M.B.A., J.D., Indiana University

Bontrager, O. R. (1965) .... Associate Professor of Education
B.A., M.A., Ph.D., University of Iowa

Borgo, Philip E. (1959) .... Instructor in Engineering
B.S.C.E., University of Cincinnati

Bowers, Charles O. (1948) .... Associate Professor of Music
B.S. in Ed., Southeast Missouri State College; M.M., D.M.A., Eastman School of Music of the University of Rochester

Bowman, Russell Keith (1956) .... Professor of Romance Languages
A.B., A.M., Ph.D., Columbia University

Boyd, Gertrude A. (1958) .... Professor of Education
A.B., M.S., Florida State University; Ed.D., Colorado State College

Boyer, Ruth G. (1963) .... Associate Professor of Social Work
B.A., University of Minnesota; M.S.S., Smith College School for Social Work

Boyland, John S., Capt. (1965) .... Assistant Professor of Aerospace Studies
B.S., New Mexico State University

Bracken, Harry M. (1963) .... Professor of Philosophy
B.A., Trinity College; M.A., Johns Hopkins University;
Ph.D., State University of Iowa

Bradford, Sarah Jane (1963) .... Instructor in Nursing
B.S., Vanderbilt University; M.A., Teachers College, Columbia University

Breckenridge, Jack D. (1962) ... Assistant Professor of Art
B.S., Wisconsin State College; M.F.A., State University of Iowa

Bredehoft, Theodore C. (1962) ... Instructor in Health, Physical Education and Recreation; Wrestling and Tennis Coach
B.S., Cornell College; M.S., University of Washington

Bregar, John F. (1965) ... Associate Professor of Engineering
B.S., Pennsylvania State University

Bregg, Elizabeth A. (1965) ... Instructor in Nursing
R.N., Ontario Hospital School of Nursing; B.S., Teachers College, Columbia University

Bresina, Bertha Mary (1960) ... Professor of Home Economics; Chairman, Department of Home Economics
B.S., M.S., Stout State College; Ph.D., Iowa State University

Breslin, Hazel B. (1962) ... Assistant Professor of Home Economics; Supervisor, Home Management House
B.S., University of Alberta; M.A., Washington State University

Britton, Mervin W. (1957) ... Assistant Professor of Music
B.S., M.S., University of Illinois

Brose, Marianna F. (1963) ... Instructor in English
B.A., College of William and Mary; M.A., Arizona State University

Brown, Donald E. (1963) ... Professor of Mass Communications
B.A., M.A., State University of Iowa

Brown, Duane (1951) ... Professor of Chemistry
B.S., Brigham Young University; Ph.D., Cornell University

Brown, Ruth Margaret (1962) ... Instructor in English
B.A., University of Montana; M.A., Texas Western College

Brown, Theodore Martin (1963) ... Assistant Professor of Chemistry
B.S., M.S., University of Toledo; Ph.D., Iowa State University

Brownstein, Aaron J. (1964) ... Associate Professor of Psychology
B.A., City College of New York; M.A., Ph.D., University of Missouri

Bruinsma, Henry A. (1964) ... Professor of Music; Dean, College of Fine Arts; Chairman, Department of Music
B.M., M.M., Ph.D., University of Michigan

Bruner, May I. (1961) ... Assistant Professor of Nursing
B.S., University of Hawaii; M.S., University of Colorado

Bryan, Charles A. (1963) ... Assistant Professor of Mathematics
B.S., Montana State University; Ph.D., University of Arizona

Bryant, Fred O. (1950) ... Associate Professor of Health, Physical Education and Recreation
B.S., Springfield College; M.S., University of Illinois; Ed.D., Arizona State University

Buffington, Albert F. (1965) ... Professor of German
A.B., Bucknell University; A.M., Ph.D., Harvard University

Bullington, Richard E. (1961) ... Professor of Education; Chairman, Department of Elementary Education
B.S., Rutgers University; M.A., Ed.D., University of Alabama

Bullock, Arnold H. (1941) ... Professor of Music
B.M., Yale University; M.A. in Ed., Arizona State University

Burdette, Walter E. (1956) ... Professor of Industrial Education; Director, Division of Industrial Design and Technology
B.S., M.S., Kansas State Teachers College; Ed.D., University of Missouri

Burgess, Donald Louis (1964) ... Instructor in Mass Communications; Assistant Director, Bureau of Broadcasting
B.A., University of Nebraska; M.S., Syracuse University

Burgoyne, Edward E. (1951) ... Professor of Chemistry
B.S., Utah State University; M.S., Ph.D., University of Wisconsin

Burk, Karl W. (1949) ... Assistant Professor of Industrial Education
B.A. in Ed., M.A. in Ed., Arizona State University; Ed.D., Bradley University

Burke, William J. (1962) ... Professor of Chemistry; Vice President for Research; Dean, Graduate College
A.B., Ohio University; Ph.D., Ohio State University

Burkhard, Samuel (1921) ... Professor Emeritus of Education
B.A., Goshen College; M.A., Columbia University; Ph.D., New York University

BURTON, ARLEIGH R. (1941) .... Professor of Accounting
A.B., M.A., Emporia State Teachers College; Ph.D., University of Nebraska; C.P.A., Arizona

BUSECK, PETER R. (1963) .... Assistant Professor of Geology and Chemistry
B.A., Antioch College; M.A., Ph.D., Columbia University

BYERS, FRANK R. (1947) .... Professor of Drama
B.A., M.A., University of Cincinnati

BYERS, NELLIE B. (1934) .... Associate Professor of Education
B.A., University of Cincinnati; M.A., Ohio State University

CANRIGHT, JAMES EDWARD (1964) .... Professor of Botany; Chairman, Department of Botany
B.A., Miami University; A.M., Ph.D., Harvard University

CARD, WILLARD R. (1964) .... Assistant Professor of Education
B.S., University of Utah; M.A. in Ed., San Jose State College

CARLSON, INGEBORG L. (1965) .... Assistant Professor of German
Ph.D., University of Erlangen (Germany)

CARMACK, ROBERT M. (1964) .... Assistant Professor of Anthropology
B.A., M.S., University of California, Los Angeles

CARR, ALICE ROSE (1955) .... Associate Professor of Mathematics
A.B., St. Mary's College; M.A., Ohio University

CARVER, GEORGE L. (1965) .... Assistant Professor of Classical Languages
B.A., University of Texas; S.T.B., St. Mary's Seminary, Baltimore; M.A., University of Texas

CASPAR, MYRON L. (1961) .... Assistant Professor of Chemistry
B.A., University of Connecticut; Ph.D., University of Colorado

CASTILLO, SENON ARTHUR (1951) .... Instructor in Health, Physical Education and Recreation; Track Coach
B.A. in Ed., Arizona State University

CASTLE, GORDON B. (1962) .... Professor of Zoology; Vice President
B.A., Wabash College; M.A., Ph.D., University of California, Berkeley

CAVALLIERE, WILLIAM A. (1947) .... Assistant Professor of Industrial Technology
B.A. in Ed., M.A. in Ed., Arizona State University

CAZIER, MONT A. (1962) .... Professor of Zoology
B.S., Ph.D., University of California, Berkeley

CHAUSOW, EUGENE (1956) .... Assistant Professor of Music
B.A. in Ed., M.A. in Ed., Arizona State University

CHRISTINE, RAY ORR (1958) .... Instructor in Education
A.B., A.M., Colorado State College

CHRONISTER, GLENN M. (1963) .... Associate Professor of Education
B.S. in Ed., M.Ed., D.Ed., University of Missouri

CLOTHIER, RONALD R. (1955) .... Associate Professor of Zoology
A.B., Fresno State College; M.A., Montana State University; Ph.D., University of New Mexico

CLUFF, GORDON L. (1963) .... Assistant Professor of Speech
B.A. in Ed., Arizona State University; M.S., Southern Illinois University

COCHRAN, JOHN A. (1962) .... Professor of Economics; Chairman, Department of Economics
A.B., Drake University; A.M., Ph.D., Harvard University

COLBY, ARTHUR L. (1965) .... Assistant Professor of English
B.A., University of Massachusetts; M.A., University of North Carolina

COLE, GERALD A. (1959) .... Professor of Biology
A.B., Middlebury College; M.S., St. Lawrence University; Ph.D., University of Minnesota

COLLINS, JACK A. (1963) .... Associate Professor of Engineering
B.M.E., M.Sc., Ph.D., Ohio State University

COMBS, CHARLES F. (1964) .... Associate Professor of Education
B.Sc., Ohio State University; Ed.D., Syracuse University

CONLIN, DAVID A. (1948) .... Professor of English Education
A.B., Syracuse University; Ph.D., Yale University

COOK, JEFFREY M. (1961) .... Assistant Professor of Architecture
B.Arch., University of Manitoba; M.Arch., Pratt Institute

COOK, PHIL ALEXANDER (1963) .... Associate Professor of Education
B.A., Southwestern State College; M.A., Colorado State College of Education;
Ed.D., University of Kansas

COPPOCK, HAROLD W. (1957) .... Associate Professor of Psychology
A.B., Antioch College; Ph.D., Indiana University

CORKE, PATRICIA P. (1964) .... Instructor in Psychology;
Clinical Field Supervisor
B.A., M.A., University of Texas; Ph.D., University of Houston

CORLISS, CHARLOTTE N. (1964) .... Instructor in Nursing
B.S. in Nur.Ed., University of Pittsburgh; M.E.D., University of Minnesota

CORONA, DOROTHY F. (1964) .... Assistant Professor of Nursing
B.S., Whitworth College; M.N., M.S.N., Western Reserve University

CORRICK, RICHARD M. (1965) .... Instructor in Health, Physical
Education and Recreation; Assistant Football Coach
B.S., Oregon State University

COUCH, SANFORD CARY (1962) .... Assistant Professor of Russian
B.A., M.A., Ph.D., University of Wisconsin

CRAIG, SAMUEL EDWARD, JR. (1960) .... Associate Professor of Engineering
B.S., Oregon State University; Ph.D., University of Utah

CRANMER, WILLIAM H. (1963) .... Associate Professor of Social Work
B.A., University of Akron; M.Sc., Western Reserve University

CROOKS, LOIS IDA (1959) .... Instructor in English
B.A., Ottawa University; M.A., University of Missouri

CROUCH, BEULAH (1953) .... Assistant Professor of Education
B.A. in Ed., M.A. in Ed., Arizona State University

CUMMINGS, SUSAN N. (1964) .... Instructor in Education
B.S., University of Chicago; M.A. in Ed., Arizona State University

CURTIS, COY L., Col. (1948-51; 1964) .... Professor of Military Science;
Chairman, Department of Military Science
B.S., United States Military Academy

DAANE, CALVIN JOHN (1963) .... Associate Professor of Education
B.S., University of Wisconsin; M.A., Teachers College, Columbia University;
Ed.D., Indiana University

DAANE, KENNETH E. (1962) .... Assistant Professor of Economics
LL.B., Ph.D., University of Colorado

DALGLEISH, DONALD DOUGLAS (1962) .... Assistant Professor of Political Science
B.A., Carleton College; A.M., Columbia University; Ph.D., University of Colorado

DAMMANN, ARTHUR E. (1955) .... Associate Professor of Zoology
B.S., Arizona State University; M.S., Ph.D., University of Michigan

DANNENFELDT, KARL H. (1956) .... Professor of History;
Dean, College of Liberal Arts
A.B., Valparaiso University; M.A., Indiana University; Ph.D., University of Chicago

DAUTEN, JOEL J. (1960) .... Professor of General Business Administration;
Chairman, Department of General Business Administration
B.S., M.S., Washington University; Ph.D., State University of Iowa

DAVIS, KEITH (1958) .... Professor of Management
B.B.A., M.B.A., University of Texas; Ph.D., Ohio State University

DAVIS, ROBERT EDWARD (1959) .... Associate Professor of Speech
A.B., A.M., Ph.D., University of Illinois

DAVIS, SANDFORD S. (1953) .... Professor of Education;
Chairman, Department of Counseling and Educational Psychology
A.B., B.S., Central Missouri State College; A.M., University of Missouri;
Ed.D., University of Colorado

DAWKINS, LOLA B. (1959) .... Associate Professor of Office Administration
and Business Education
B.B.A., Texas Western College; M.B.A., Ph.D., University of Texas

DAWSON, DORA (1959) .... Assistant Professor of Nursing
R.N., Edward W. Sparrow School of Nursing; B.S., Wayne State University;
M.A., University of Chicago

DECKER, JOHN P. (1963) .... Professor of Engineering
B.S., University of Idaho; M.A., Ph.D., Duke University

DEEVER, R. MERWIN (1959) .... Professor of Education;
Director, Bureau of Educational Research and Services
A.B., Southwestern College; Ed.M., Ed.D., University of Oklahoma

DeJong, John Arlo (1959) .... Assistant Professor of History
B.A., Central College; M.A., University of Iowa; Ph.D., State University of Iowa

Demeke, Howard J. (1962) .... Associate Professor of Education
A.B., San Francisco State College; M.S., Ed.D., University of Southern California

Dickinson, Arthur L. (1952) .... Associate Professor of Health,
Physical Education and Recreation
B.A., Iowa State Teachers College; M.S., Indiana University;
Ph.D., State University of Iowa

Ditsworth, Richard Lee (1959) .... Associate Professor of Engineering
B.S., M.S., Iowa State College; Ph.D., Michigan State University

Donnelly, Aaron V. (1962) .... Associate Professor of Engineering
B.S. in E.E., M.S., State University of Iowa; A.M., Columbia University;
Ph.D., State University of Iowa

Downing, George D., Jr. (1964) .... Professor of Marketing;
Chairman, Department of Marketing
B.S. in E.E., Iowa State College; D.B.A., Michigan State University

Downs, John L., Capt. (1963) .... Assistant Professor of Aerospace Studies
B.A., Texas A & M University

Doyle, Donald Philip (1962) .... Assistant Professor of Speech and Drama
B.A., Arizona State University; M.A., Northwestern University

Doyle, Roy P. (1959) .... Professor of Education;
Director, I. D. Payne Training School; Assistant Dean, College of Education
B.A. in Ed., Arizona State University; M.A., Ed.D., Columbia University

Dresskell, Miles A. (1945) .... Professor of Music
B.M., Northwestern University; B.A., San Jose State College;
M.A., Teachers College, Columbia University

Dresskell, Nadine (1946) .... Associate Professor of Music
B.S., Bowling Green State University; M.A., Teachers College, Columbia University

Dudek, Leona M. (1960) .... Assistant Professor of Education
B.Ed., National College of Education; M.A. in Ed., Arizona State University

Dudley, Guilford A. (1956) .... Associate Professor of History
A.B., Harvard University; M.A., Ph.D., University of California, Los Angeles

Durham, G. Homer (1960) .... President of the University;
Professor of Political Science
B.A., University of Utah; Ph.D., University of California, Los Angeles

Dycus, Augustus M. (1959) .... Associate Professor of Botany
B.S., Akron University; Ph.D., Cornell University

Edwards, John Leonard (1964) .... Instructor in Education
B.S., Ball State Teachers College; M.A. in Ed., Arizona State University

Edwards, Marvin J. (1959) .... Assistant Professor of Industrial Technology
B.S., M.A. in Ed., Arizona State University

Edwards, Robert W., Lt. Col. (1962) .... Professor of Aerospace Studies;
Chairman, Department of Aerospace Studies
B.A., San Francisco State College

Ekmanis, Rolf (1963) .... Assistant Professor of Russian
B.A., M.A., University of Wisconsin

Ellis, John C. (1957) .... Associate Professor of English
B.A., M.A., Ph.D., University of Oregon

Ellis, Robert H. (1962) .... Assistant Professor of Mass Communications;
Director, Bureau of Broadcasting
B.A. in Ed., Arizona State University; M.A., Western Reserve University

Ellner, Anthony, Jr. (1960) .... Professor of Architecture
B.A., Brooklyn College; M.A., Columbia University; B.Arch., Yale University

Ellsworth, Lola (1938) .... Associate Professor of Home Economics
B.S., Brigham Young University; M.A., Teachers College, Columbia University

Elmore, James W. (1949) .... Professor of Architecture;
Dean, College of Architecture
A.B., University of Nebraska; M.S. in Arch., Columbia University

Emery, Raymond C. (1962) .... Associate Professor of English
B.A., M.A., University of Wyoming; Ed.D., Stanford University

English, William S. (1962) .... Associate Professor of Music
B.M., Washburn University; M.A., Ph.D., Peabody College

Erno, Richard B. (1957-62; 1963) .... Associate Professor of English
B.A., Michigan State University; M.A., University of Denver;
Ph.D., University of Minnesota

Escudero, Mary J. (1948) .... Associate Professor of Spanish
A.B., San Diego State College; M.A., Claremont College; Diplome, University of
Paris-Institute de Phonetique; Ph.D., Cornell University

Evans, John X. (1964) .... Assistant Professor of English
B.A., Holy Cross College; M.A., Yale University

Eyring, LeRoy (1961) .... Professor of Chemistry;
Chairman, Department of Chemistry
B.Sc., University of Arizona; Ph.D., University of California, Berkeley

Fare, Don E. (1964) .... Assistant Professor of Education
B.S., Abilene Christian College; M.Ed., Ed.D., Texas Technological College

Farnsworth, Frederick J. (1962) .... Instructor in Industrial Technology
B.S., Utah State University

Farris, Martin T. (1957) .... Professor of Economics
B.A., M.A., University of Montana; Ph.D., Ohio State University

Faust, Verne (1963) .... Associate Professor of Education
B.S., Arizona State University; M.S., Ed.D., Indiana University

Fearon, Harold Edward (1961) .... Professor of Management
B.S., M.B.A., Indiana University; Ph.D., Michigan State University

Ferrell, Wilfred Anderson (1959) .... Associate Professor of English;
Director, Freshman English
B.A., M.A., Ph.D., University of Texas

Finch, Alice Joyce (1965) .... Instructor in Nursing
B.N.S., Augustana College; M.S., University of Colorado

Fink, Raymond R. (1958) .... Associate Professor of Art
B.A.E., School of Art Institute of Chicago; M.S.A.E., Institute of Design,
Illinois Institute of Technology

Fischer, Donald E. (1964) .... Assistant Professor of
General Business Administration
B.S.B.A., Washington University; M.B.A., University of Detroit;
D.B.A., Washington University

Fisher, Marvin Mark (1958) .... Associate Professor of English
A.B., A.M., Wayne State University; Ph.D., University of Minnesota

Fletcher, Grant (1956) .... Professor of Music
B.Mus., Illinois Wesleyan University; M.M., University of Michigan;
Ph.D., Eastman School of Music

Florschuetz, Leon Walter (1964) .... Assistant Professor of Engineering
B.S., M.S., Ph.D., University of Illinois

Flynn, James Thomas (1964) .... Assistant Professor of Architecture
B.of Arch., Carnegie Institute of Technology; M. of Arch., Harvard University

Frasier, James E. (1963) .... Associate Professor of Education
B.A., Colorado State College; M.A., University of Michigan;
Ed.D., Colorado State College

Freund, John E. (1957) .... Professor of Mathematics
B.A., M.A., University of California, Los Angeles; Ph.D., University of Pittsburgh

Frost, Melvin Jesse (1965) .... Assistant Professor of Geography
B.S., Arizona State University; M.S., Brigham Young University;
Ph.D., University of Florida

Fry, Harold (1958) .... Associate Professor of Engineering
B.S., Colorado State University; M.E., University of Wyoming;
M.S., University of Colorado

Fuchs, Jacob (1951) .... Professor of Chemistry;
Director, Instruments Laboratory
B.A., New York University; M.S., Ph.D., University of Illinois

Fuller, Richard G., Capt. (1965) .... Assistant Professor of Military Science
B.S., University of Maryland

Fullerton, Bill J. (1958) .... Professor of Education;
Chairman, Department of Secondary Education
B.S. in Ed., Northwestern State College; Ed.M., D.Ed., University of Oklahoma

Fullington, Gilbert A. (1959) .... Associate Professor of Art
B.F.A., Ohio State University; M.A., Ed.D., Teachers College, Columbia University

Gable, Frederick K. (1963) .... Assistant Professor of Music
B.A., Carthage College; M.A., State University of Iowa

GAFFNEY, PHILIP D. (1957) .... Associate Professor of Education
B.S., Northern Illinois State College; M.A., Ph.D., State University of Iowa

GALLOWAY, JOSEPH H. (1962) .... Associate Professor of Animal Science; University Veterinarian
B.S., M.S., Michigan State University; B.V.Sc., M.R.C.V.S., University of Queensland

GAMBRELL, CARROLL B., JR., (1959) .... Professor of Engineering; Chairman, Industrial Engineering Faculty
B.S.E., Clemson University; M.S.E., University of Florida; Ph.D., Purdue University

GARABEDIAN, PETER G. (1965) .... Associate Professor of Sociology
B.A., University of Redlands; M.A., Ph.D., University of Washington

GERLACH, VERNON S. (1963) .... Associate Professor of Education
B.A. in Educ., Wayne State University; M.A., University of Minnesota;
Ed.D., Arizona State University

GERSHENFELD, WALTER JAY (1965) .... Associate Professor of Management
B.S., Temple University; A.M., Ph.D., University of Pennsylvania

GERSTEN, CHARLES D. (1964) .... Assistant Professor of Psychology
B.B.A., City College of New York; Ph.D., Florida State University

GIESCHEN, DONALD W. (1959) .... Assistant Professor of Philosophy
B.S., Northwestern University; M.A., Ph.D., University of Minnesota

GILLANDERS, DOROTHY F. (1937) .... Professor of Health, Physical Education and Recreation
B.S., Oregon State College; M.A., Columbia University; Ed. D., University of Southern California

GISOLO, MARGARET (1954) .... Associate Professor of Health, Physical Education and Recreation
B.S., Indiana State Teachers College; M.A., New York University

GOHEEN, DOUGLAS-SCOTT (1965) .... Assistant Professor of Drama
A.B., College of William and Mary

GOLDIAMOND, ISRAEL (1960) .... Professor of Psychology
B.A., Brooklyn College; Ph.D., University of Chicago

GOLDSTEIN, MYRON (1963) .... Assistant Professor of Mathematics
B.S., M.A., Ph.D., University of California, Los Angeles

GOO, BENJAMIN (1955) .... Associate Professor of Art
B.F.A., State University of Iowa; M.F.A., Cranbrook Academy of Art

GOODALL, LEONARD E. (1962) .... Assistant Professor of Political Science; Director, Bureau of Government Research
B.A., Central Missouri State College; M.A., University of Missouri;
Ph.D., University of Illinois

GOODWIN, JOHN B. (1948) .... Assistant Professor of Industrial Education; Assistant to Director of Physical Plant
B.A., Arizona State University; M.S., Oregon State University

GRACE, EDWARD E. (1963) .... Professor of Mathematics
B.S., Ph.D., University of North Carolina

GREENE, JAY ROBERT (1965) .... Associate Professor of Management
B.A., Los Angeles State College; M.B.A., University of California, Los Angeles;
Ph.D., Ohio State University

GREENSPOON, JOEL (1963) .... Professor of Psychology; Director, Clinical Psychology Training Program
B.S., University of Virginia; M.A., University of Pennsylvania;
Ph.D., Indiana University

GRIER, MARVIN (1957) .... Assistant Professor of Health, Physical Education and Recreation; Supervisor of Swimming Pool
B.S., Wisconsin State College; M.A., New York University

GRIFFITH, LEROY H. (1958) .... Associate Professor of Education
B.S. in Ed., M.S. in Ed., Drake University; Ph.D., State University of Iowa

GRIGGS, JOANNE LORRAINE (1963) .... Instructor in Speech and Drama
B.F.A., Drake University; M.A., University of Washington

GRIMES, JOHN O. (1928) .... Professor Emeritus of Psychology
B.S. in Ed., Ohio University; M.A., Ph.D., University of Michigan

GROBE, EDWIN P. (1957) .... Associate Professor of French
A.B., William Jewel College; M.A., Ph.D., Indiana University

GROOMS, RICHARD HARRIS (1963) .... Associate Professor of Architecture
B.Sc., M.Sc., University of Wisconsin

GRYDER, ROBERT (1959-61; 1964) .... Associate Professor of Office Administration and Business Education; Assistant Dean, College of Business Administration
B.S., Northwestern State College; M.Ed., Louisiana State University; Ed.D., University of North Dakota

GUILLORY, RICHARD JOHN (1964) .... Assistant Professor of Chemistry
B.A., Reed College; Ph.D., University of California, Los Angeles

GUILLOT, ELLEN ELIZABETH (1964) .... Associate Professor of Sociology
B.S., Simmons College; M.A., Ph.D., University of Pennsylvania

GUPTA, SOMESHWAR C. (1963) .... Associate Professor of Engineering
B.A., M.A., Punjab University (India); B.Sc., Glasgow University (Scotland); M.S., Ph.D., University of California, Berkeley

GURNEE, HERBERT (1943) .... Professor of Psychology
A.B., M.A., Wesleyan University; Ph.D., Harvard University

GUTOWSKY, ALBERT R. (1965) .... Assistant Professor of Economics
B.A., University of Denver; M.S., University of Oregon

GYOROG, DONALD A. (1962) .... Associate Professor of Engineering
B.S., M.S., State University of Iowa; Ph.D., University of Wisconsin

HAGGERSON, NELSON L. (1961-63; 1964) .... Professor of Education
B.A., Vanderbilt University; M.S. in Ed., New Mexico Western College; Ph.D., Claremont Graduate School

HAHN, ARTHUR WILLIAM (1962) .... Instructor in Art
B.F.A., California School of Fine Arts; M.A., San Francisco State College

HALE, DAVID A. (1964) .... Instructor in Drama; Technical Director, Theater Arts, Gammage Auditorium
B.A., Pomona College; M.F.A., Yale University

HALE, JOHN DOUGLAS (1956) .... Assistant Professor of Art
B.F.A., M.F.A., University of Southern California; Ph.D., Ohio State University

HAMM, GEORGE F. (1962) .... Assistant Professor of Education; Dean of Men
B.S., South Dakota State College; M.A., Ph.D., University of Wyoming

HANNER, LORETTA A. (1957) .... Professor of Nursing; Dean, College of Nursing
R.N., Michael Reese Hospital School of Nursing; P.H.N., B.S., University of Minnesota; M.S., Cornell University

HANSON, FRANCES F. (1965) .... Associate Professor of Education
B.S. in Ed., Moorhead State College; M.A., University of Minnesota; Ed.D., University of Montana

HANSON, HUGH (1948) .... Professor of Zoology
B.S. in Ed., Kansas State Teachers College; M.S., Ph.D., University of Illinois

HANSON, WARREN W., Lt. Col. (1959) .... Assistant Professor of Military Science
B.A., University of Washington

HAPP, WILLIAM W. (1962) .... Professor of Engineering
B.Sc., McGill University; M.Sc., Massachusetts Institute of Technology; Ph.D., Boston University

HARDWICK, SALLY J. (1964) .... Instructor in Health, Physical Education and Recreation
B.S., Kansas State University; M.A., Colorado State College

HARING, LAUREL LLOYD (1959) .... Professor of Geography; Chairman, Department of Geography
B.S. in Ed., M.S., Kansas State Teachers College; Ph.D., State University of Iowa

HARRIS, BRICE (1962) .... Professor of English
B.A., Erskine College; M.A., Vanderbilt University; Ph.D., Harvard University

HARRIS, WILLIAM H. (1960) .... Professor of Marketing
B.S., University of Denver; M.B.A., Ph.D., Ohio State University

HARTER, TOM J. (1937) .... Professor of Art
B.A. in Ed., Arizona State University; M.F.A., University of Oregon

HARWARD, NAOMI (1956) .... Associate Professor of Sociology
B.D., Garrett Biblical Institute; B.A., Northwestern University; M.A. (Rel. Ed.) M.A. (Social Welfare), University of Chicago

HASBROUCK, FRANK F. (1962) .... Assistant Professor of Entomology
B.A., Ph.D., University of Illinois

HASDORFF, LAWRENCE (1964) .... Assistant Professor of Engineering
B.A., University of Texas; B.S.E.E., University of California, Berkeley; M.E.E., New York University; Ph.D., University of California, Berkeley

Hawley, John B. (1957) .... Instructor in Engineering
B.S., Colorado School of Mines

Headington, Robert C. (1953) .... Professor of Economics
A.B., Kenyon College; M.S., Ph.D., Ohio State University

Heath, Robert W. (1965) .... Professor of Mathematics
B.S., Ph.D., University of North Carolina

Heimann, Robert A. (1952) .... Professor of Education;
Counselor Trainer; Head, Guidance Center
B.S., Wisconsin State College; M.S., Ph.D., University of Wisconsin

Helmstadter, G. C. (1959) .... Professor of Education
B.S., M.S., Iowa State University; Ph.D., University of Minnesota

Henderson, Douglas James (1962) .... Associate Professor of Physics
B.A., University of British Columbia; Ph.D., University of Utah

Henshaw, Marjorie B. (1953) .... Assistant Professor of English
B.A. in Ed., M.A. in Ed., Arizona State University

Herman, George R. (1956) .... Assistant Professor of English
B.S., M.A., University of Kansas

Hilkert, E. J. (1933) .... Professor Emeritus of Accounting;
Dean Emeritus, College of Business Administration
B.S. in B.A., M.A., University of Southern California; LL.B., University of
Notre Dame; C.P.A., Arizona and California

Hill, James E., Jr. (1964) .... Assistant Professor of Geography
A.B., M.Sc., Ph.D., University of Tennessee

Hill, Louis A., Jr. (1958) .... Assistant Professor of Engineering
B.A., B.S.C.E., M.S.C.E., Oklahoma State University

Hill, Robert C. (1961) .... Associate Professor of Accounting
B.B.A., M.B.A., Hofstra College; D.B.A., Harvard University

Hines, Harold C. (1952) .... Associate Professor of Music; Director of Band
B.S. in Mus.Ed., M.S. in Mus. Ed., University of Illinois

Hink, Heinz R. (1958) .... Professor of Political Science
LL.B., University of Berlin; M.A., Ph.D., University of Washington

Hirsch, Harvey (1961) .... Instructor in English
B.A. in Ed., M.A. in Ed., M.A. (English), Arizona State University

Hollingsworth, Paul M. (1962) .... Assistant Professor of Education
B.S., Brigham Young University; M.A. in Ed., Ed. D., Arizona State University

Hook, Ralph C., Jr. (1958) .... Professor of General Business Administration;
Director, Bureau of Business Research and Services
A.B., M.A., University of Missouri; Ph.D., University of Texas

Hoover, Helene M. (1957) .... Assistant Professor of Home Economics
B.S., M.S., Louisiana State University

Hoover, Kenneth H. (1956) .... Professor of Education
B.S., M.A., Louisiana State University; Ed.D., University of Washington

Hopkins, Ernest J. (1949) .... Professor Emeritus of Journalism
B.A., University of Southern California

Hoult, Thomas Ford (1964) .... Professor of Sociology;
Chairman, Department of Sociology
A.B., University of Illinois; M.A., Whittier College;
Ph.D., University of Southern California

Howells, Edmund Gibson (1960) .... Assistant Professor of Philosophy
B.A., University of Utah; M.A. (Phil.), University of Michigan;
M.A. (English), Middlebury College

Hoyt, Charles D., Jr. (1962) .... Associate Professor of Engineering
B.S.Ch.E., M.S.I.E., Ph.D., Purdue University

Hubbard, Paul G. (1950) .... Professor of History;
Chairman, Department of History
A.B., Wabash College; M.A., Ph.D., University of Illinois

Hudson, John William (1964) .... Associate Professor of Sociology
B.S., M.A., Ph.D., Ohio State University

Hughes, Carlyle D. (1965) .... Assistant Professor of Accounting
B.A. in B.A., Washington State University; M.B.A., University of Washington

Huhnke, Frances S. (1964) .... Instructor in Nursing
B.S., University of Arizona; M.S., University of Colorado

Huizingh, William (1959) .... Professor of Accounting; Chairman, Department of Accounting
B.S.B.A., M.B.A., University of Denver; Ph.D., University of Michigan; C.P.A., Colorado

Hunnicutt, Harold B. (1962) .... Associate Professor of Education; Assistant Dean, Graduate College
B.S. in Educ., Ed.M., Ed.D., University of Oklahoma

Huntington, Virginia R. (1962) .... Associate Professor of Accounting
B.A., M.B.A., University of Kansas; Ph.D., University of Texas

Hurst, Kathleen J. (1962) .... Instructor in English
B.A., Farleigh Dickinson University; M.A., Arizona State University

Hurtgen, Charles (1962) .... Assistant Professor of English
A.B., M.A., Ph.D., University of California, Berkeley

Huston, Gerald D. (1962) .... Assistant Professor of Office Administration and Business Education
B.S.C., M.A., State University of Iowa

Impson, Wells F. (1960) .... Instructor in Physics
B.S., United States Coast Guard Academy; M.S., Arizona State University

Inglish, Ida Joyce (1963) .... Instructor in English
B.A., University of Colorado; M.A., Arizona State University

Ingold, Kenneth R., Major (1963) .... Assistant Professor of Military Science
B.S., M.A., University of Wichita

Isaak, Donald (1962) .... Assistant Professor of Music
B.F.A., University of South Dakota; M.M., D.Mus., Northwestern University

Ives, John C. (1962) .... Assistant Professor of Anthropology
B.A., M.A., State University of Iowa; Ph.D., Harvard University

Jacks, Mary L. (1955) .... Associate Professor of Office Administration and Business Education
B.A., M.A., Arizona State University; C.P.S.

Jackson, Marvin R., Jr. (1962) .... Assistant Professor of Economics
B.S., M.A., University of Colorado

Jacob, Richard John (1963) .... Assistant Professor of Physics
B.S., Ph.D., University of Utah

Jacobson, Arthur (1956) .... Associate Professor of Art
B.S., M.S., University of Wisconsin

Jahraus, Agnes (1963) .... Associate Professor of Nursing
B.A., Jamestown College; R.N., University of Minnesota; M.A., Teachers College, Columbia University

Jakob, John H. (1960) .... Assistant Professor of Architecture
B.Arch., Ohio State University; M.S. in Arch., Columbia University

Jankowski, Daniel F. (1964) .... Assistant Professor of Engineering
B.S.E., M.S.E., Ph.D., University of Michigan

Jelinek, James J. (1953) .... Professor of Education
B.S., University of Illinois; M.A., Northwestern University; Ed.D., Indiana University

Jensen, Richard B., Capt., (1962) .... Assistant Professor of Aerospace Studies
B.S., Utah State University

Johnson, Josephine H. (1964) .... Instructor in Education
B.A. in Ed., M.A. in Ed., Arizona State University

Johnson, Rosemary (1959) .... Associate Professor of Nursing; Acting Dean, 1965-66, College of Nursing
R.N., Milwaukee County General Hospital; B.S., M.P.H., University of Minnesota

Johnson, Roy M. (1952-53; 1955) .... Professor of Microbiology
A.B., M.S., University of Chicago; Ph.D., University of New Mexico

Jones, Daisy M. (1963) .... Associate Professor of Education
B.S., M.S., Indiana State College; Ed.D., Indiana University

Jones, Daryl D., Capt. (1960) .... Assistant Professor of Military Science
B.S., United States Military Academy

Jones, Gordon C. (1964) .... Assistant Professor of Mass Communications
B.A., Whittier College; M.S., University of Oregon

Jones, John A. (1961) .... Professor of Anthropology
B.A., University of New Mexico; Ph.D., Columbia University

Jones, Sybil Monica (1961) .... Instructor in Nursing
B.S. in Nursing; Ohio State University; M.A., Teachers College, Columbia University

Jordan, Edward L. (1964) .... Associate Professor of Engineering
B.S. in E.E., M.S. in E.E., Ph.D., University of Kansas

Jordan, Terry G. (1965) .... Assistant Professor of Geography
B.A., Southern Methodist University; M.A., University of Texas

Judd, B. Ira (1937) .... Professor of Agronomy
B.S., M.S., Utah State University; Ph.D., University of Nebraska

Kagy, Virginia L. (1947) .... Professor of Home Economics;
Director of Nursery School
B.A., Drake University; M.S., Iowa State University; Ph.D., Johns Hopkins University

Kaiser, Louis Howard (1959) .... Associate Professor of Education
B.S.E., University of Arkansas; M.A., University of Wyoming;
Ed.D., University of Arkansas

Kajikawa, William M. (1937) .... Associate Professor of Health,
Physical Education and Recreation; Freshman Football Coach
B.A. in Ed., M.A. in Ed., Arizona State University

Kaminsky, Elijah Ben-Zion (1962) ...... Associate Professor of Political Science
A.B., A.M., Ph.D., Harvard University

Kaufman, Irving (1965) .... Professor of Engineering
B.E., Vanderbilt University; M.S., Ph.D., University of Illinois

Kaufman, Lucile B., (1950) .... Assistant Professor of Engineering
B.S.M.E., M.S., University of Colorado

Kazmier, Leonard John (1965) .... Associate Professor of Management
A.B., M.A., Wayne State University; Ph.D., Ohio State University

Keating, Patricia B. (1948) .... Associate Professor of Music
B.M., University of Illinois; M.M., Northwestern University

Keenan, Ruth (1955) .... Assistant Professor of English
B.A., M.A., University of Montana

Keith, Marlow (1946) .... Assistant Professor of Industrial Education
B.A. in Ed., M.A. in Ed., Arizona State University

Keller, Fred S. (1964) .... Professor of Psychology
B.S., Tufts College; A.M., Ph.D., Harvard University

Kelly, Eugene Thomas (1963) .... Assistant Professor of Education
A.B., A.M., Ed.D., Colorado State College

Kelly, John B. (1963) .... Associate Professor of Mathematics
B.A., Columbia University; Ph.D., Massachusetts Institute of Technology

Kelly, Richard W. (1965) .... Associate Professor of Engineering
B.S.E.E., M.S., Ph.D., University of Iowa

Kemp, Paul C. (1958) .... Instructor in Health, Physical Education
and Recreation; Assistant Football Coach
B.S., M.A., State University of Iowa

Kentner, Martin Millard (1961) .... Assistant Professor of Health,
Physical Education and Recreation
Ed.B., University of Buffalo; M.A., Teachers College, Columbia University

Kerr, Nancy Joy (1963) .... Research Assistant Professor of Psychology
B.S., University of Illinois; M.A., Ph.D., University of Houston

Kersten, Robert D. (1957) .... Professor of Engineering;
Chairman, Civil Engineering Faculty
B.S., M.S., Oklahoma State University; Ph.D., Northwestern University

Kevane, Clement J. (1956) .... Professor of Physics
B.S., Ph.D., Iowa State College

Kiesow, Milton A. (1957) .... Associate Professor of Education
B.S., University of Wisconsin; M.A., Ph.D., University of Nebraska

Kigin, Denis J. (1958) .... Professor of Industrial Education
B.S., State Teachers College, Mankato; M.S., Stout State College;
Ed.D., University of Missouri

Kingsbury, Warren T. (1964) .... Assistant Professor of Education
A.B., Central College; A.M., University of Missouri

Kirkpatrick, William Edward (1959) ...... Instructor in Office Administration
and Business Education
B.A. in Ed., M.A. in Ed., Arizona State University

Klann, Margaret (1945) .... Associate Professor of Health,
Physical Education and Recreation
B.S., University of Illinois; M.A. in Ed., Colorado State College of Education

KLEINFELD, GERALD R. (1962) .... Assistant Professor of History
B.A., New York University; M.A., University of Michigan; Ph.D., New York University

KLOCK, JOHN WESTON (1960) .... Professor of Engineering
B.E., University of Southern California; M.S., Ph.D., University of California, Berkeley

KNOWLTON, JOHN F. (1964) .... Assistant Professor of Spanish
B.A., Lewis and Clark College; M.A., University of Oregon

KNOX, ROBERT L. (1963) .... Assistant Professor of Economics
B.S., M.S., Oklahoma State University; Ph.D., University of North Carolina

KOKENA, PATRICIA J. (1964) .... Instructor in Nursing
B.S.N., Loretto Heights College; M.S.N., Wayne State University

KRENKEL, JOHN H. (1947) .... Professor of History
B.S. in Ed., University of Illinois; M.A., Claremont Graduate School;
Ph.D., University of Illinois

KROUT, JOHN A. (1962) .... Professor of History
A.B., University of Michigan; A.M., Ph.D., Columbia University

KRUEGER, H. CALVERT (1957) .... Associate Professor of Accounting
B.S. in B.A., University of Wichita; M.A., University of North Dakota;
C.P.A., Missouri, Arizona, Kansas and North Dakota

KUNKEL, JOHN HOWARD (1959) .... Assistant Professor of Sociology
B.A., Pomona College; A.M., Ph.D., University of Michigan

KUSH, FRANK (1957) .... Assistant Professor of Health, Physical Education and Recreation; Head Football Coach
B.A., Michigan State University; M.S., Arizona State University

KUTCH, DENIS P. (1962) .... Instructor in Architecture
B.Arch., University of Southern California

KYRALA, ALI (1960-62; 1964) .... Professor of Physics
B.Sc., Massachusetts Institute of Technology; M.Sc., Stanford University;
S.M., Harvard University; D.Sc., Technische Hochschule Wien (Vienna, Austria)

LAETZ, HANS G. (1964) .... Assistant Professor of German
A.B., University of California, Berkeley; A.M., Stanford University

LAKE, ROBERT L. (1958) .... Instructor in Mathematics
B.S., South Dakota School of Mines and Technology; M.A., Arizona State University

LAMBERTS, JACOB J. (1960) .... Professor of English
B.A., Calvin College; M.A., Ph.D., University of Michigan

LAMM, ROBERT C. (1959) .... Professor of Music
B.M., University of Louisville; M.M., University of Arizona; Ph.D., Indiana University

LANCE, ROBERT E. (1960) .... Assistant Professor of Mass Communications
B.S., Kent State University; M.S.J., Northwestern University

LANDEIRA, RICARDO L. (1962) .... Assistant Professor of Spanish
Bachiller Universitario, University of Santiago, Spain; Maestro Nacional,
Escuala Normal of Santiago, Spain

LANDERS, E. JAMES (1960) .... Associate Professor of Zoology
A.B., M.S., University of Wyoming; Ph.D., New York University

LANDINI, RICHARD G. (1959) .... Associate Professor of English; Assistant Dean, Graduate College
A.B., M.A., University of Miami; Ph.D., University of Florida

LARSON, ARLYN J. (1964) .... Assistant Professor of Economics
Ph.B., M.A., University of North Dakota; Ph.D., University of Illinois

LAVIK, RUDOLPH H. (1933) .... Professor Emeritus of Health, Physical Education and Recreation
B.A., Concordia College; B.P.E., Springfield College;
M.A., University of Southern California

LEATHERS, CHESTER RAY (1957) .... Associate Professor of Botany
B.S., Eastern Illinois University; M.S., Ph.D., University of Michigan

LEE, IDELLE B. (1962) .... Instructor in Education
B.A., University of Wisconsin; M.A. in Ed., Arizona State University

LEVY, LEO B. (1959) .... Professor of English
A.B., M.A., Ph.D., University of California, Berkeley

LEWIS, MAURICE S. (1954) .... Professor of Education
B.S. in Ed., M.S. in Ed., Drake University; Ed. D., Colorado State College of
Education

LIGHTFOOT, MARJORIE J. (1964) .... Assistant Professor of English
B.A., Brown University; M.A., Ph.D., Northwestern University

Lindstrom, Frederick B. (1953) .... Associate Professor of Sociology
A.B., M.A., Ph.D., University of Chicago

Lish, Terrence G. (1963) .... Instructor in English
B.A., University of Arizona; M.A., University of Nevada

Liskovec, Richard F. (1958) .... Assistant Professor of Mathematics
B.S., M.A., Kent State University

Littrell, Joseph J. (1958) .... Professor of Industrial Education
A.B., Nebraska State Teachers College; M.A., University of Minnesota
Ed.D., University of Missouri

Liu, Chui H. (1965) .... Professor of Chemistry
B.A., Ph.D., University of Illinois

Livermore, Paul E. (1958) .... Assistant Professor of Mathematics
B.S., M.A., Arizona State University

Logan, Earl, Jr. (1963) .... Associate Professor of Engineering
B.S., M.S., Texas Agricultural and Mechanical College; Ph. D., Purdue University

Loge, Betty Jane (1962) .... Assistant Professor of Nursing
B.S., M.S., University of Minnesota

Lombardi, Eugene P. (1957) .... Associate Professor of Music
B.Mus.Ed., Westminster College; M.A., Columbia University

LoPresti, Ronald (1964) .... Assistant Professor of Music
B.M., M.M., Eastman School of Music of the University of Rochester

Lowe, John W. (1956) .... Associate Professor of
General Business Administration
B.S., Arizona State University; M.S., University of Wisconsin;
Ph.D., University of Florida

Lowenstein, Lloyd L. (1957) .... Professor of Mathematics
A.B., Ph.D., Cornell University

Lowenstein, Milton D. (1959) .... Assistant Professor of Architecture
B.A., M.A., Columbia University

Luenow, Paul F., Jr. (1958) .... Associate Professor of Spanish
B.A., M.A., University of Washington; Ph.D., University of New Mexico

Lundberg, Horace W. (1962) .... Professor of Social Work;
Dean, Graduate School of Social Service Administration
B.S., Utah State University; M.S., University of Utah; M.S.W., University of
California, Berkeley; Ph. D., University of Minnesota

Lundgren, Harry Richard (1962) .... Assistant Professor of Engineering
B.S.C.E., Purdue University; M.S., Arizona State University

Lundin, Robert Folke (1962) .... Assistant Professor of Geology
B.A., Augustana College; M.S., Ph.D., University of Illinois

Lyle, Mary G. (1959) .... Assistant Professor of English
B.A., State University of Iowa; M.A., University of South Dakota

Lyon, Robert B. (1938) .... Associate Professor of Mathematics
B.S., B.M., University of Illinois; M.S., University of Idaho

MacDonald, Audrey (1963) .... Assistant Professor of Philosophy
A.B., Pembroke College; M.A., Johns Hopkins University; Ph.D., University of Texas

Manheim, Henry L. (1958) .... Associate Professor of Sociology
A.B., University of California, Los Angeles; M.A., Ph.D., University of
Southern California

Mann, William G. (1961) .... Instructor in Health, Physical
Education and Recreation; Freshman Basketball Coach;
Varsity Golf Coach
B.S. in Educ., M.Ed., University of Arizona

Manning, Duane (1951) .... Professor of Education
B.S., M.A., Ball State Teachers College; Ed.D., Indiana University

Maris, Ronald W. (1965) .... Assistant Professor of Sociology
A.B., A.M., University of Illinois

Martinez, John R. (1957) .... Associate Professor of History
B.A., Brigham Young University; M.A., Ph.D., University of California, Berkeley

Martinez, Quino E. (1957) .... Associate Professor of Spanish
B.S., New Mexico Western College; M.A., George Peabody College;
Ph.D., University of North Carolina

Mason, Bruce B. (1960) .... Professor of Political Science
B.S., North Texas State College; M.A., Texas Christian University;
Ph.D., University of Texas

McCann, Charles W. (1963) .... Associate Professor of Social Work
A.B., San Diego State College; M.S.W., D.S.W., University of Southern California

McCarter, Joan H. (1961) .... Assistant Professor of Mathematics
B.S., M.A., University of Arizona

McConnell, Robert E. (1962) .... Assistant Professor of Architecture
B.Arch.E., Washington State University; M.Arch., Massachusetts Institute of Technology

McCready, Richard Ralph (1960) .... Associate Professor of Office Administration and Business Education
B.S., Valley City State Teachers College; M.A., Ed.D., Colorado State College

McElroy, John L., Capt. (1963) .... Assistant Professor of Aerospace Studies
B.S., University of Kentucky

McGrath, G. D. (1950) ...... Professor of Education; Dean, College of Education
A.B., Findlay College; M.A., University of Michigan; Ph.D., University of Colorado

McInnis, Martha Ann (1964) .... Assistant Professor of Home Economics
B.S., M.S., University of Alabama

McIntire, E. Bernell (1959) .... Assistant Professor of German
A.B., M.A., Brigham Young University

McLeod, Dorothy L. (1957) .... Assistant Professor of Nursing
R.N., St. Joseph's Hospital School of Nursing; B.S., St. Louis University; M.S., Teachers College, Columbia University

Meador, Bruce S. (1959) .... Associate Professor of Education
B.A., M.Ed., Ph.D., University of Texas

Mech, Edmund V. (1964) .... Professor of Social Work
A.B., Florida Southern College; M.S. in Ed., Ph.D., Indiana University; M.S.S., Bryn Mawr College

Meirovitch, Leonard (1962) .... Associate Professor of Engineering
B.Sc., Israel Institute of Technology; M.S., Ph.D., University of California, Los Angeles

Meister, Arnold G. (1957) .... Professor of Physics
B.S., Central YMCA College; Ph.D., Illinois Institute of Technology

Menke, Robert F. (1947) .... Professor of Education; Director of Placement Center
B.S., Oshkosh State College; M.A. in Ed., Ph.D., Northwestern University

Metzger, Darryl E. (1963) .... Assistant Professor of Engineering
B.S., Mech. Engr., M.S. Mech. Engr., Ph.D., Stanford University

Meyerson, Lee (1962) .... Professor of Psychology
A.B., Lafayette College; A.M., University of California, Los Angeles; Ph.D., Stanford University

Michael, Jack (1960) .... Associate Professor of Psychology
B.A., M.A., Ph.D., University of California, Los Angeles

Michels, LeMoyne F. (1963) .... Associate Professor of Construction
B.S., United States Military Academy

Miller, Irwin (1958) .... Professor of Mathematics
B.A., Alfred University; M.S., Purdue University; Ph.D., Virginia Polytechnic Institute

Miller, Paul T. (1947) .... Professor of Geology; Chairman, Department of Geology
B.A., Simpson College; M.S., Ph.D., State University of Iowa

Miller, Victor J. (1958) .... Professor of Horticulture
B.S., M.S., Ph.D., University of Illinois

Minckley, Wendell Lee (1963) .... Assistant Professor of Biology
B.S., Kansas State University; M.A., University of Kansas; Ph.D., University of Louisville

Mitchell, Fredric F. (1961) .... Associate Professor of Education
B.A., M.A., University of Arizona; Ph.D., Columbia University

Mitchell, Richard Allen (1963) .... Assistant Professor of Geography
B.S., Western Michigan University; Ph.D., State University of Iowa

Moan, Obert B. (1963) .... Professor of Engineering
B.S.P.S.E., Purdue University; M.S., University of Minnesota; Ph.D., Purdue University

Moffit, Inez (1953) .... Assistant Professor of Library Science
B.A., Iowa State Teachers College; B.L.S., University of Minnesota M.A., University of Denver

Montague, Gene B. (1957) .... Associate Professor of English
B.A., Central Washington College of Education; M.A., Ph.D., University of Texas

MOODY, E. GRANT (1951) .... Professor of Animal Science
B.S., University of Arizona; M.S., Kansas State University;
Ph.D., Purdue University

MOORE, CARLETON B. (1961) .... Assistant Professor of Chemistry;
Director, Laboratory for Meteoritic Research
B.S., Alfred University; Ph.D., California Institute of Technology

MORAN, DENNIS V. (1964) .... Assistant Professor of English
A.B., University of Notre Dame; B.A., M.A., Oxford University

MORRIS, DONALD H. (1962) .... Assistant Professor of Anthropology
B.A., Arizona State University; M.A., University of Arizona

MORRIS, MARY SCOTT (1947) .... Assistant Professor of Education
A.B., Western Kentucky State College; M.A., Northwestern University

MORTENSEN, MARTIN (1932) .... Associate Professor Emeritus
A.B., Brigham Young University; A.M., University of Arizona

MOSER, ALEXANDER J., Major (1962) ...... Assistant Professor of Military Science
B.A., Syracuse University

MUNCH, THEODORE WILLIAM (1959) .... Professor of Science Education
B.S. in Ed., B.S. in Bacteriology, Ohio State University; M.A. in Ed., Colorado State College; Ed.D., Stanford University

MUNK, MORTON E. (1961) .... Associate Professor of Chemistry
B.S., Northwestern University; M.S., University of Miami;
Ph.D., Wayne State University

MURPHY, JOAN R. (1962) .... Assistant Professor of Accounting
B.A., Arizona State College; M.A. in Ed., M.S., Arizona State University
LL.B., University of Arizona; C.P.A., Arizona

MURPHY, NINA L. (1924) .... Professor of Health, Physical Education
and Recreation
B.S. in Ed., University of Arizona; M.A., University of Southern California

MYERS, LOUIS M. (1937) .... Professor of English
B.A., St. Stephen's College; M.A., Columbia University;
Ph.D., University of California, Berkeley

MYKLESTAD, NILS O. (1961) .... Professor of Engineering
Cand. Polyt., Royal Technical College, Copenhagen, Denmark;
Ph.D., Cornell University

NACZKI, MARGARET V. (1960) .... Assistant Professor of Nursing
R.N., St. Joseph's Hospital School of Nursing, Chicago; B.S., Incarnate Word College

NEBEKER, HELEN E. (1958) .... Assistant Professor of English
B.A., M.A., Arizona State University

NELSON, HAROLD D. (1962) .... Instructor in Engineering
B.S., South Dakota School of Mines and Technology; M.S., Kansas State University

NELSON, JUDITH ANN (1962) .... Instructor in Education
B.A. in Ed., M.A. in Ed., Arizona State University

NERING, EVAR D. (1960) .... Professor of Mathematics;
Chairman, Department of Mathematics
A.B., A.M., Indiana University; A.M., Ph.D., Princeton University

NEUHEISEL, RICHARD G. (1963) .... Assistant Professor of
General Business Administration
B.B.A., LL.B., University of Wisconsin

NEWBURN, HARRY K. (1963) .... Professor of Education
B. Ed., Western Illinois State University; M.A., Ph.D., State University of Iowa

NEWLIN, CHARLES W. (1961) .... Associate Professor of Engineering
B.S., Rose Polytechnic Institute; S.M., Harvard University

NICHOLS, CATHERINE G. (1952) .... Professor of Education;
Associate Dean of Students
A.B., M.A., University of Kentucky; Ed.D., Teachers College, Columbia University

NIELANDER, WILLIAM A. (1958) .... Professor of Marketing
B.S., University of Pittsburgh; M.S., Ph.D., Columbia University

NIGAM, BISHAN PERKASH (1964) .... Professor of Physics
B.Sc., M.Sc., University of Delhi (India); Ph.D., University of Rochester

NORTHEY, WILLIAM T. (1959) .... Associate Professor of Microbiology
B.A., University of Minnesota; M.A., Ph.D., University of Kansas

NUTT, MERLE C. (1956) .... Professor of Engineering
B.S.Chem.E., Illinois Institute of Technology; M.A., State University of Iowa;
LL.D., Illinois Wesleyan University

O'Bannon, Charles E. (1964) .... Assistant Professor of Engineering
B.S. in C.E., University of New Mexico; M.S., Harvard University

O'Beirne, Donald E. (1959) .... Professor of Education
B.E., Whitewater State Teachers College; M.A., Ed.D., Northwestern University

O'Brien, Carmen (1959) .... Assistant Professor of Education
B.A. in Ed., M.A. in Ed., Arizona State University

O'Connor, Dennis James (1963) .... Assistant Professor of Economics
A.B., Fairleigh Dickinson University; M.A., New School for Social Research, New York City

O'Keeffe, Michael (1963) .... Assistant Professor of Chemistry
B.Sc., Ph.D., University of Bristol

Oliver, Robert S. (1963) .... Assistant Professor of Architecture
A.B., M.A., University of California, Berkeley

Olmsted, Camfron B. (1956) .... Assistant Professor of Education
B.A. in Ed., M.A. in Ed., Arizona State University; Ed.D., Colorado State College

Osenburg, Frederic C. (1946) .... Associate Professor of English
A.B., M.A., University of Michigan; Ph.D., University of Illinois

Oswalt, Howard C. (1959) .... Assistant Professor of Education
B.A., M.A., University of Idaho; Ed.D., University of Southern California

Overman, Glenn D. (1956) .... Professor of General Business Administration;
Dean, College of Business Administration
B.S., Central State College; M.S., Oklahoma State University;
D.B.A., Indiana University

Owen, John E. (1964) .... Associate Professor of Sociology
B.A., Duke University; A.M., Ph.D., University of Southern California

Pacilio, John, Jr. (1964) .... Assistant Professor of Speech
B.A., Kansas State University; M.A., University of Colorado

Packer, Merle (1959) .... Assistant Professor of Health,
Physical Education and Recreation
B.A., M.A., Arizona State University

Padalis, Pranas (1959) .... Associate Professor of Economics
M.A., Ph.D., University of Vytautas The Great (Lithuania)

Palais, Joseph C. (1964) .... Assistant Professor of Engineering
B.S., University of Arizona; M.S.E., Ph.D., University of Michigan

Palfrey, Thomas Rossman (1962) .... Professor of Romance Languages
B.A., M.A., Indiana University; Docteur de l'Université de Paris

Parker, Ernest L. (1950) .... Professor of Poultry Science
B.S., M.S., University of Halle; Ph.D., University of Leipzig (Germany)

Parker, L. Mayland (1955) .... Professor of Agricultural Economics
B.S., Brigham Young University; M.S., University of Utah; Ph.D., Cornell University

Patten, Duncan T. (1965) .... Assistant Professor of Botany
B.A., Amherst College; M.S., University of Massachusetts; Ph.D., Duke University

Patterson, Robert A. (1957) .... Associate Professor of Zoology
B.S., University of Michigan; M.S., Ph.D., Ohio State University

Paulsen, George E. (1959) .... Assistant Professor of History
B.A., Hobart College; M.A., Rutgers University; Ph.D., Ohio State University

Paxton, Robert R. (1959) .... Assistant Professor of Industrial Education
B.A., College of Emporia; M.A., Arizona State University

Peabody, Stanley J. (1952) .... Assistant Professor of Industrial Design
and Technology
B.S., M.A. in Ed., Arizona State University

Peck, George B. (1958) .... Assistant Professor of Mathematics
B.S., Arizona State University; M.S., University of Illinois

Peek, George A., Jr. (1964) .... Professor of Political Science
B.A., M.A., Ph.D., University of Virginia

Penman, Kenneth Albert (1962) .... Assistant Professor of Health,
Physical Education and Recreation
B.A., M.A., Sacramento State College; Ph.D., University of Southern California

Perril, Lester S. (1957) .... Professor of Education
B.A., Ohio Wesleyan University; M.A., Ohio State University;
Ph.D., University of North Carolina

Peters, William S. (1959) .... Professor of General Business Administration
B.A., Dartmouth College; M.B.A., Ph.D., University of Pennsylvania

Peterson, John R. (1963) .... Assistant Professor of Architecture
B.A., St. Olaf College; B.Arch., University of Minnesota;
M.Arch., Harvard University

Pettit, George Robert (1965) .... Professor of Chemistry
B.S., Washington State University; M.S., Ph.D., Wayne State University

Péwé, Troy L. (1965) .... Professor of Geology; Chairman, Department of Geology
A.B., Augustana University; M.S., State University of Iowa;
Ph.D., Stanford University

Phillips, William W. (1958) .... Assistant Professor of History
Ph.B., M.A., University of North Dakota; Ph.D., University of Missouri

Pian, Richard H. J. (1959) .... Professor of Engineering
B.S.C.E., Kung Shang University (China); M.S.E., Ph.D., Cornell University

Pike, Kenneth V. (1962) .... Assistant Professor of Science Education
B.S., University of Massachusetts; M.A., Long Beach State College;
Ed.D., University of California, Los Angeles

Pike, Norma J. (1964) .... Assistant Professor of Health,
Physical Education and Recreation
B.S., M.S., University of Southern California

Pinkava, Donald John (1964) .... Assistant Professor of Botany
B.S., M.S., Ph.D., Ohio State University

Pittman, Anne (1952) .... Associate Professor of Health,
Physical Education and Recreation
B.S. in P.Ed., University of Texas; M.A., New York University

Plantz, Don V. (1960) .... Associate Professor of Economics
B.S., M.B.A., University of Kansas; Ph.D., Indiana University

Pliskoff, Stanley S. (1965) .... Associate Professor of Psychology
A.B., M.A., Ph.D., New York University

Plummer, Ramona F. (1957) .... Assistant Professor of Health,
Physical Education and Recreation
B.S., M.A., University of Alabama

Podlich, William F., Jr. (1949) .... Professor of Education
B.S., Maryland State Teachers College; M.A., Teachers College, Columbia University;
Ph.D., State University of Iowa

Portmann, Walter O. (1959) .... Associate Professor of Mathematics
B.S. in Ed., Kent State University; M.S., Ph.D., Case Institute of Technology

Portnoff, Collice H. (1945) .... Professor of English
A.B., M.A., University of California, Berkeley; Ph.D., Stanford University;
F.A.A.R., M.A., American Academy in Rome

Powers, Doris C. (1960) .... Assistant Professor of English
B.A., Wellesley College; M.A., Occidental College

Price, Thornton W. (1961) .... Professor of Engineering
B.S., University of Illinois; M.S., Lehigh University; Ph.D., University of Illinois

Pritsker, A. Alan B. (1962) .... Associate Professor of Engineering
B.S., M.S., Columbia University; Ph.D., Ohio State University

Prong, John K. Jr., Major (1964) .... Assistant Professor of Aerospace Studies
B.S., University of Southern California

Prust, Zenas A. (1959) .... Assistant Professor of Industrial Education
B.S., Stout State University; M.A., University of Minnesota;
Ed.D., Colorado State College

Putnik, Edwin V. (1962) .... Assistant Professor of Music
B.A., Northwestern University; M.M., Eastman School of Music

Quirk, Daniel (1959) .... Instructor in English
B.A., B.S., Arizona State University

Radke, Judith J. (1960) .... Assistant Professor of French
B.S., M.A., University of Wisconsin; Ph.D., University of Colorado

Ralston, Mack A. (1956) .... Associate Professor of Education;
Chairman, Department of Educational Foundations
B.S., M.S., Indiana State Teachers College; Ed.D., Indiana University

Randall, Virginia F. (1962) .... Assistant Professor of English
B.A., College of New Rochelle; M.A., Arizona State University

Randolph, E. Dale A. (1963) .... Assistant Professor of Spanish
B.A., University of Virginia; M.A., Tulane University

Rannells, Jessie M. (1939) .... Professor of Home Economics
B.S., Iowa State University; M.S., Cornell University; Ph.D., University of Wisconsin

RAPP, JAMES R. (1962) .... Assistant Professor of Architecture
B.Arch.Engr., University of Detroit

RASMUSSEN, DAVID I. (1963) .... Assistant Professor of Zoology
B.S., M.S., University of Utah; Ph.D., University of Michigan

RASMUSSEN, ROBERT D. (1949) .... Assistant Professor of Animal Science
B.S., Iowa State University; M.S., Washington State University

RATLIFF, JOHN D. (1954) .... Associate Professor of English
B.A. in Ed., Arizona State University; M.A., Claremont Graduate School;
Ph.D., Stanford University

RATTERREE, JACK L. (1964) .... Instructor in Music
B.M., Curtis Institute of Music; M.A., The American University

RAWLS, WILLIAM S. (1949) .... Associate Professor of Physics
B.S., Murray State College; M.S., Tulane University; Ph.D., Iowa State University

REIN'L, ROBERT L. (1961) .... Professor of Philosophy;
Chairman, Department of Philosophy
A.B., A.M., Ph.D., Harvard University

REISER, CASTLE O. (1958) .... Professor of Engineering;
Chairman, Chemical Engineering Faculty
B.S., Colorado Agricultural & Mechanical College; Petr. Eng., Colorado
School of Mines; Ph.D., University of Wisconsin

RENNELLS, MAX RAYMOND (1962) .... Instructor in Art
B.S., Eastern Illinois University; A.M., Colorado State College

RENNER, GEORGE T. (1951) .... Professor of Geography
B.A., Stanford University; M.A., Ed.D., Columbia University

REUTER, VINCENT GEORGE (1961) .... Associate Professor of Management
B.S.C., M.A., Ph.D., State University of Iowa

RICE, ROSS R. (1950) .... Professor of Political Science
M.A., Ph.D., University of Chicago

RICE, ROY C. (1946) .... Professor of Education;
Dean of Summer Session and Extension
B.S., University of New Mexico; M.S., University of Massachusetts;
Ph.D., University of Texas

RICE, WARREN (1958) .... Professor of Engineering
B.S., M.S., Ph.D., Agricultural and Mechanical College of Texas

RICHARDSON, GRANT L. (1953) .... Professor of Agronomy
B.S., M.S., University of Arizona; Ph.D., Oregon State University

RICHARDSON, H. D. (1940) .... Professor of Education
Ph.B., Ph.M., University of Wisconsin; Ph.D., Northwestern University

RICKEL, HARRY P. (1948) .... Associate Professor of Music
B.M., M.M., University of Arizona

RIDER, WENDELL J. (1953) .... Professor of Music
B.S., Iowa State Teachers College; M.M., Eastman School of Music;
Ph.D., State University of Iowa

RIGGINS, L. F. (1956) .... Assistant Professor of Agricultural Mechanics
B.S. in Ed., Arizona State College; M.A. in Ed., Arizona State University

ROBBINS, EARL REDING (1961) .... Instructor in Engineering
B.S. in E.E., Texas Technological College; M.S., Arizona State University

ROBINSON, CHARLES D. (1964) .... Assistant Professor of Mathematics
B.A., Hardin-Simmons University; M.A., Ph.D., University of Texas

ROBINSON, DANIEL O. (1950) .... Professor of Agronomy;
Director, Division of Agriculture
A.B., Brigham Young University; M.S., University of Arizona;
Ph.D., Ohio State University

ROBINSON, RICHARD O., Capt. (1962) ...... Assistant Professor of Aerospace Studies
B.S., Utah State University

ROESSEL, ROBERT A., JR. (1959) .... Professor of Education
A.B., M.A., Washington University; Ed.D., Arizona State University

ROTTMAN, DICK LAVELLE (1964) .... Assistant Professor of
General Business Administration
B.S., Arizona State University; M.A., Ph.D., University of Pennsylvania

ROVER, R. CRAIG (1952) .... Associate Professor of Education
B.A., Upsala College; M.A., St. Lawrence University; Ph.D., Cornell University

ROWE, KENNETH LEROY (1962) .... Assistant Professor of Office Administration and Business Education; Coordinator of Distributive Education
B.A., M.A., Iowa State Teachers College

ROY, RADHA R. (1963) .... Professor of Physics
B.Sc., M.Sc., Presidency College, University of Calcutta; Ph.D., University of London

RUFF, PAUL F. (1958) .... Associate Professor of Engineering
B.S.C.E., M.S.C.E., Case Institute of Technology

RUNDBERG, WILLIAM B. (1962) .... Instructor in Mathematics
A.B., San Jose State College; A.M., Bowdoin College

RUPPÉ, REYNOLD J. (1960) .... Professor of Anthropology; Chairman, Department of Anthropology
B.A., University of New Mexico; Ph.D., Harvard University

SACKS, BENJAMIN (1963) .... Professor of History
B.A., University of New Mexico; M.A., McGill University; Ph.D., Stanford University

SALERNO, NICHOLAS ANDREW (1961) .... Assistant Professor of English
B.A. in Ed., M.A., Arizona State University; Ph.D., Stanford University

SAMPLE, L. LAETITIA (1964) .... Assistant Professor of Anthropology
A.B., Whitman College

SANDERS, BEVIE T. (1957) .... Associate Professor of Accounting
B.B.A., North Texas State College; M.S., Agricultural and Mechanical College of Texas; Ph.D., University of Texas; C.P.A., Texas

SANDERSON, ROBERT T. (1963) .... Professor of Chemistry
B.S., Yale University; Ph.D., University of Chicago

SANSONE, FRED J. (1965) .... Assistant Professor of Mathematics
B.S.E., M.S.E., University of Michigan; M.S., Ph.D., Rutgers University

SATCHELL, BERNITA M. (1961) .... Assistant Professor of Nursing
B.S. in P.H.N., M.P.H., University of Minnesota

SATER, VERNON E. (1962) .... Assistant Professor of Engineering
B.S. in Chem. Engr., M.S. in Chem. Engr., Ph.D., Illinois Institute of Technology

SAVAGE, NEVIN W. (1959) .... Associate Professor of Mathematics
B.S., M.A., Pennsylvania State University; Ph.D., University of California, Los Angeles

SCANNELL, EDWARD E. (1964) .... Assistant Professor of Marketing; Coordinator of Executive Programs
A.B., A.M., Colorado State College

SCHABACKER, JOSEPH C. (1963) .... Professor of Management; Academic Vice President
B.S., Temple University; M.B.A., Ph.D., University of California, Los Angeles

SCHAUMBURG, DONALD (1953) .... Professor of Art
B.A. in Art Ed., California College of Arts and Crafts; M.F.A., Claremont College

SCHILLING, DOROTHY C. (1932) .... Professor of English
A.B., M.A., Ph.D., Stanford University

SCHMIDT, ALFRED H. (1960) .... Associate Professor of Marketing
B.S., University of Oklahoma; M.B.A., D.B.A., Indiana University

SCHOELLER, WILBUR CHARLES (1964) .... Professor of Engineering
B.S. in C.E., M.S. in C.E., Ph.D., University of Texas

SCHREIBER, MARY C. (1965) .... Assistant Professor of Social Work
B.A., University of Southern Illinois; M.S.W., Washington University

SCHRIEBER, HENRY H. (1961) .... Assistant Professor of Art
B.F.A., University of New Mexico; M.F.A., Cranbrook Academy of Art

SCHROEDER, CLIFFORD M. (1956) .... Associate Professor of Physics
B.S., Washington State University; M.A., Ph.D., Ohio State University

SCHULTE, MARGARET M. (1965) .... Instructor in English
B.A., University of North Dakota; M.A., Arizona State University

SCHUTZ, RICHARD E. (1957) ...... Professor of Education; Director, Testing Bureau
B.A., M.A., University of California, Los Angeles; Ph.D., Columbia University

SCOTT, WALTER T. (1961) .... Professor of Mathematics
B.A., M.A., Ph.D., Rice University

SCOULAR, DAVID B. (1952) .... Professor of Music; Manager, Grady Gammage Memorial Auditorium
B.A., Texas Christian University; B.M., Lawrence College; M.A., Columbia University

SEBALD, HANS (1963) .... Assistant Professor of Sociology
B.A., Manchester College; M.Sc., Ph.D., Ohio State University

Seipp, Kenneth Frank (1963) .... Associate Professor of Music
B.S., Hartwick College; M.M., Conservatory of Music, The University of Kansas City; Mus.Ed.D., Indiana University

Shaifer, Edward F., Jr. (1960) .... Associate Professor of Construction
B.S., United States Military Academy

Sherman, J. Gilmour (1964) .... Associate Professor of Psychology
B.A., Bowdoin College; A.M., Ph.D., Columbia University

Sherman, Thomas L. (1964) .... Assistant Professor of Mathematics
B.A., University of California, Los Angeles; M.S., Ph.D., University of Utah

Shofstall, W. P. (1950) .... Professor of Education; Dean of Students; Director of Student Activities
B.S. in Ed., Northeast Missouri State Teachers College; M.A., Ph.D., University of Missouri

Silvaroli, Nicholas J. (1963) .... Associate Professor of Education
B.S. in Ed., Fredonia State College; M.A., University of Buffalo; Ed.D., Syracuse University

Simmons, Douglas J. (1963) .... Assistant Professor of French
A.B., Wabash College; M.A.T., Harvard University; Certificat de francais usuel, degré supérieur, Certificat de prononciation francaise, La Sorbonne

Sinkov, Abraham (1963) .... Professor of Mathematics
B.S., College of City of New York; M.A., Columbia University; Ph.D., George Washington University

Skelton, James W. (1964) .... Associate Professor of Education
B.S., M.A., Ph.D., Ohio State University; LL.B., Rutgers University

Smith, Arlene N. (1960) .... Assistant Professor of Health, Physical Education and Recreation
B.A. in Ed., University of Redlands; M.A., Los Angeles State College

Smith, Charles B. (1964) .... Associate Professor of General Business Administration
B.S., Drake University; M.S., New Mexico Highlands University; Ed.D., Colorado State College

Smith, Clyde B. (1952) .... Associate Professor of Health, Physical Education and Recreation; Director of Intercollegiate Athletics; Chairman, Department of Health, Physical Education and Recreation
A.B., Geneva College; M.S. in Ed., Indiana University

Smith, Lehi T. (1959) .... Associate Professor of Mathematics
B.S., M.A. in Ed., Arizona State University; Ed.D., Stanford University

Smith, Louise Cockrell (1963) .... Professor of Home Economics
A.B., Texas Christian University; M.A., Columbia University; Ph.D., Yale University

Smith, Margo M. (1963) .... Instructor in Music
B.Mus., Grinnell College; M.A. in Ed., Arizona State University

Smith, Marion W. (1952) .... Assistant Professor of Music
B.S. in Mus.Ed., Capital University; M.M., American Conservatory of Music

Smith, McDonald (1962) .... Assistant Professor of Art
B.A., M.A., University of Texas

Smith, Ronald D. (1963) .... Assistant Professor of History
A.B., San Diego State College; Ph.D., University of Southern California

Snyder, Ernest E., Jr. (1958) .... Associate Professor of Physics
A.B., M.A., Colorado State College; Ed.D., New York University

Spragins, Catherine R. (1963) .... Instructor in Nursing
B.S., University of Rochester

Spragins, John D., Jr. (1963) .... Assistant Professor of Engineering
B.S., Oklahoma State University; M.S., Ph.D., Stanford University

Staats, Arthur W. (1955) .... Professor of Psychology
A.B., M.A., Ph.D., University of California, Los Angeles

Staats, Carolyn K. (1957) .... Associate Professor of Psychology
A.B., M.A., Ph.D., University of California, Los Angeles

Stadmiller, Jack Edward (1963) .... Assistant Professor of Technical Communications
B.A., University of Utah; M.A., Arizona State University

Stafford, Alfred B. (1958) .... Professor of Engineering
B.S.E.E., Carnegie Institute of Technology; M.A., University of Pittsburgh; Ph.D., University of Chicago

Stafford, Kenneth (1957) .... Associate Professor of Education
B.A., M.Ed., Ph.D., University of Oklahoma

Stahnke, Herbert L. (1941) .... Professor of Zoology; Director, Poisonous Animals Research Laboratory
S.B., University of Chicago; M.A., University of Arizona; Ph.D., Iowa State University

Stalzer, Frank S. (1955) .... Assistant Professor of Music
B.M.Ed., University of Kansas; M.M., Eastman School of Music

Starsky, Morris J. (1964) .... Assistant Professor of Philosophy
B.A., University of Rochester; M.A., University of Michigan

Staudhammer, John (1964) .... Professor of Engineering
B.S., M.S., Ph.D., University of California, Los Angeles

Stein, Peter K. (1959) .... Professor of Engineering
S.B. (Bus.Adm.), S.B.M.E., M.S., Massachusetts Institute of Technology

Steinmann, Wilbur L. (1959) .... Associate Professor of Engineering
B.E.E., University of Minnesota; M.S.E.E., State University of Iowa

Stellhorn, Martin (1963) .... Associate Professor of Music
Mus.B., St. Louis Institute of Music; Mus.M., Northwestern University;
Ph.D., Washington University

Steverson, Norris J. (1932) .... Associate Professor of Health, Physical Education and Recreation; Gymnastics Coach
B.A. in Ed., Arizona State University; M.S. in Ed., University of Southern California

Stewart, Donald G. (1964) .... Assistant Professor of Mathematics
B.A., M.S., University of Utah; Ph.D., University of Tennessee

Stewart, Ernest I., Jr. (1959) .... Professor of Health Education; Assistant Dean, College of Liberal Arts
B.S., M.S., Utah State University; Ph.D., Columbia University

Stewart, Kenneth M. (1947) .... Professor of Anthropology
A.B., M.A., Ph.D., University of California, Berkeley

Stites, William H. (1954) .... Associate Professor of Speech; Debate Coach
B.A., Louisiana Polytechnic Institute; M.A., Ph.D., University of Denver

Stoner, Richard G. (1963) .... Professor of Physics; Chairman, Department of Physics
A.B., A.M., Ph.D., Princeton University

Stout, Irving W. (1953) .... Professor of Education
B.Ed., Plattesville State Teachers College; M.A., Ed.D., Northwestern University

Stovall, Jack K. (1963) .... Instructor in Health, Physical Education and Recreation; Assistant Football Coach
B.A., Arizona State University

Straub, Calvin C. (1961) .... Professor of Architecture
B. of Arch., University of Southern California

Streufert, Hildegarde (1961) .... Assistant Professor of Home Economics
B.S., University of Minnesota; M.S., Iowa State University

Stuler, John H. (1963) .... Instructor in Art
B.A., M.F.A., Arizona State University

Stumpf, Angela M. (1959) .... Assistant Professor of Nursing
R.N., St. Mary's Hospital School of Nursing; B.S.N.E., Marquette University;
M.A., University of Chicago

Sullivan, Howard J. (1964) .... Assistant Professor of Education
B.S., Oregon College of Education; M.Ed., Ph.D., University of Oregon

Sundwall, Harry West (1962) .... Professor of Education; Assistant Dean, College of Education
B.S., Brigham Young University; Ph.D., University of California, Berkeley

Sutton, Dwight (1963) .... Assistant Professor of Psychology
B.S., M.S. (Educ.), M.S. (Psych.), University of Idaho;
Ph.D., University of California, Berkeley

Swimmer, Alvin (1963) .... Assistant Professor of Mathematics
B.A., Pennsylvania State University; M.S., New York University;
Ph.D., University of California, Berkeley

Tackett, Stanford L. (1962) .... Assistant Professor of Chemistry
B.Sc., Ph.D., Ohio State University

Tamburo, Richard P. (1958) .... Instructor in Health, Physical Education and Recreation; Assistant Football Coach
B.S., Michigan State University

Tate, Donald J. (1958) .... Professor of Office Administration and Business Education; Chairman, Department of Office Administration and Business Education
B.S., Kansas State Teachers College; M.A., Ed.D., New York University

Taylor, Eugene Mark (1964) .... Assistant Professor of Psychology
B.S., Idaho State College; M.S., Ph.D., University of Washington

Taylor, Jack Joseph (1960) .... Associate Professor of Art
B.S. in Art Ed., State Teachers College, Kutztown;
M.Ed., Pennsylvania State University

Taylor, Louis (1949) .... Assistant Professor of English
B.S. in Ed., M.A., Ohio State University

Taysom, Elvin D. (1953) .... Associate Professor of Animal Science
B.S., University of Idaho; M.S., Utah State University;
Ph.D., Washington State University

Theobald, Clarabelle (1962) .... Assistant Professor of Nursing
B.S., Arizona State University; M.S., University of California, Los Angeles

Thomas, Edwin N. (1962) .... Professor of Geography
B.S., Northern Illinois University; M.S., Ph.D., Northwestern University

Thompson, Lee P. (1955) .... Professor of Engineering; Dean, College of Engineering Sciences; Director, School of Engineering
B.A., Indiana University; M.S., Ph.D., Agricultural and Mechanical College of Texas

Thompson, Truet B. (1959) .... Professor of Engineering; Chairman, Electrical Engineering Faculty
B.S. (Math), B.S.E.E., Louisiana Polytechnic Institute; M.S., Oklahoma
State University; Ph.D., Northwestern University

Thompson, Wilma M. (1959) .... Instructor in Mathematics
A.B., New Mexico Highlands University; M.S., University of Wyoming

Thomson, Ronald G. (1947) .... Professor of Health, Physical Education and Recreation; Vice Chairman, Department of Health, Physical Education and Recreation
B.S., Springfield College; M.A. in Ed., Arizona State University;
Ed.D., University of Southern California

Thomson, Tom Radford (1961) .... Associate Professor of Chemistry
B.S., University of California, Berkeley; M.S., Ph.D., Kansas State University

Thornton, William E. (1963) .... Instructor in Engineering
B.A., Beloit College; B.S., M.S., University of Illinois

Tilden, Arnold (1937) .... Professor of History
B.A., M.A., DePauw University; Ph.D., University of Southern California

Tolbert, Donald E. (1964) .... Assistant Professor of Education
B.A., M.A., Ed.D., Colorado State College

Tsagris, B. E. (1965) .... Associate Professor of General Business Administration
B.S., University of California, Berkeley; M.S., Ph.D., University of Southern California

Turnbow, James W. (1959) .... Professor of Engineering
B.S.M.E., Texas Technological College; M.S. in E.M., Ph.D., University of Texas

Turner, Katharine C. (1946) .... Professor of English
B.Ed., Illinois State Normal University; M.A., Ph.D., University of Michigan

Uhl, Raymond (1959) .... Professor of Political Science
B.A., M.A., University of Virginia; Ph.D., Johns Hopkins University

Van Petten, Donald R. (1942) .... Professor Emeritus of Political Science
A.B. in Ed., Arizona State University; M.S. in Ed., University of
Southern California; Ph.D., Stanford University

Van Scoy, Herbert A. (1963) .... Professor of Spanish; Acting Chairman, Department of Foreign Languages
B.A., M.A., University of Alabama; Ph.D., University of Wisconsin

Van Wagenen, Richard Keith (1963) .... Assistant Professor of Education
B.A., Pacific Union College; M.A. in Ed., Arizona State University;
Ph.D., University of Utah

Variakojis, Danguole J. (1964) .... Assistant Professor of Anthropology and Music
B.M., Chicago Musical College

Vergis, John P. (1954) .... Professor of Education
B.S., M.A., New York University; Ed.D., University of Southern California

Verhave, Thom (1963) .... Associate Professor of Psychology
A.B., Ph.D., Columbia University

VICHULES, LEO D. (1961) .... Assistant Professor of Political Science
A.B., M.A., University of Michigan

VIRGILLO, CARMELO (1965) .... Assistant Professor of Spanish
A.B., State University of New York; M.A., Ph.D., Indiana University

VON DER HEYDT, ALFRED (1950) .... Associate Professor of German
Diploma, University of Frankfurt-on-the-Main; M.A., Yale University;
Ph.D., Cornell University

VOSS, HOWARD G. (1964) .... Instructor in Physics
A.B., Hope College; M.N.S., Arizona State University; M.S., Purdue University

VOTICHENKO, T. ALEXANDER (1956) .... Assistant Professor of Philosophy
A.B., Princeton University; M.A., Columbia University

WAGER, ALAN T. (1949) .... Professor of Physics
B.S., Hobart College; M.A., Cornell University; Ph.D., University of Chicago

WAGNER, RONALD F. (1962) .... Assistant Professor of Art
B.S., University of Wisconsin; M.F.A., State University of Iowa

WALKER, CHARLES S. (1963) .... Instructor in Engineering
B.S. in E.E., M.S., University of Kansas

WALKER, JANET F. (1960) .... Associate Professor of Nursing
B.S., Western Reserve University; M.S., Catholic University of America

WALLACE, CHARLES E. (1958) .... Professor of Engineering;
Chairman, Engineering Science Faculty
B.S., Lewis and Clark College; M.S., Oregon State University;
Ph.D., Stanford University

WALLACE, MARCEL HAROLD (1964) .... Assistant Professor of French
B.A., M.A., New York University

WALRAFEN, DONALD E. (1963) .... Associate Professor of Education
B.A., Kansas State Teachers College; Th.M, Iliff School of Theology;
Ph.D., University of Denver

WARD, JACK W. (1964) .... Associate Professor of Construction
B.S. in C.E., University of Idaho

WARNER, MONT MARCELLUS (1963) .... Assistant Professor of Geology
A.B., M.A., Brigham Young University; Ph.D., State University of Iowa

WASSER, PAULA R. KLOSTER (1927) .... Professor Emeritus of Art
B.S. in Ed., University of North Dakota; M.A., Stanford University

WATSON, RONALD (1963) .... Associate Professor of Engineering
B.S., Illinois Institute of Technology; M.S., Ph.D., California Institute of Technology

WEBER, DELBERT D. (1962) .... Assistant Professor of Education
B.A., Midland College; M.Ed., Ed.D., University of Nebraska

WEGNER, ARTNOLL L. (1957) .... Professor of Health, Physical
Education and Recreation
B.S., Wisconsin State College; M.S., University of Wisconsin;
P.E.D., Indiana University

WEISS, THOMAS M. (1956)....Professor of Education; Director of Student Teaching
B.A., M.A., Ph.D., Michigan State University

WEXLER, CHARLES (1930) .... Professor of Mathematics
S.B., Harvard College; A.M., Ph.D., Harvard University

WHEELOCK, WARREN H. (1964) .... Instructor in Education
B.A., M.S. in Ed., Queens College

WHIFFEN, MARCUS (1960) .... Professor of Architecture
B.A., M.A., University of Cambridge

WHITE, JOHN PATRICK (1963) .... Professor of Political Science;
Chairman, Department of Political Science
A.B., University of Cincinnati; A.M., Ph.D., University of Chicago

WHITE, MALCOLM A. (1966) .... Assistant Professor of Marketing
B.A., M.B.A., Pennsylvania State University

WHITEHURST, HARRY B. (1959) .... Associate Professor of Chemistry
B.A., M.A., Ph.D., The Rice Institute

WHYBARK, DAVID CLAY (1965) .... Assistant Professor of Management
B.S.A.E., University of Washington; M.B.A., Cornell University

WILCOX, SIDNEY W. (1955) ...... Associate Professor of Technical Communications
B.A., Bethany-Peniel College; M.A., University of Oklahoma

WILKINSON, JOSEPH WYTHE (1964) .... Assistant Professor of Accounting
B.S., Carnegie Institute of Technology; M.B.A., Stanford University;
C.P.A., California

Williamson, Jack U. (1964) .... Assistant Professor of Education
B.Sc. in Educ., Ohio State University; M.A., Miami University;
Ph.D., Ohio State University

Willson, Loretta L. (1947) .... Assistant Professor of Speech
B.A., University of South Dakota; M.A., Northwestern University

Wilson, Andrew A. (1963) .... Instructor in Economics
B.A., Claremont Men's College; M.A., Claremont Graduate School

Wilson, Gloria Natale (1961) .... Assistant Professor of Office
Administration and Business Education
B.A., Montclair State College; M.A., Ed.D., Teachers College, Columbia University

Wilson, Irma (1922) .... Professor Emeritus of Spanish
A.B., University of Montana; A.M., Teachers College, Columbia University;
Ph.D., Columbia University

Wilson, Lynn D. (1961) .... Professor of Engineering
B.S., M.S., Ph.D., Marquette University

Wilt, Glenn Audubon, Jr. (1963) .... Assistant Professor of
General Business Administration
A.B., Occidental College; M.B.A., Miami University; Ph.D., University of Michigan

Winkelman, Richard D. (1965) .... Assistant Professor of Economics
A.B., Southern Illinois University; A.M., University of Illinois

Winkles, Bobby B. (1958) .... Instructor in Health, Physical Education
and Recreation; Head Baseball Coach
B.Ph., Illinois Wesleyan University; M.S., University of Colorado

Wirtz, Dorothy (1959) .... Associate Professor of French
B.A., State University of Iowa; M.A., Ph.D., University of Wisconsin

Wochner, Raymond E. (1952) .... Professor of Education;
Chairman, Department of Educational Administration and Supervision
B.S., York College; M.A., University of Nebraska; Ph.D., University of Wyoming

Wollam, Owen A. (1964) .... Assistant Professor of French
B.A., M.A., University of Montana

Wood, Harry (1954) .... Professor of Art; Chairman, Department of Art
B.A., M.A., University of Wisconsin; M.A., Ph.D., Ohio State University

Wooldridge, Charles B. (1959) .... Associate Professor of Engineering
A.B., B.S. in C.E., University of Kentucky; M.S., Ph.D., Purdue University

Wooldridge, Mary Carolyn (1959) .... Assistant Professor of Home Economics
B.S., M.S., University of Kentucky

Woolf, Charles M. (1961-63; 1964) .... Professor of Zoology
B.S., M.S., University of Utah; Ph.D., University of California, Berkeley

Wootten, William W. (1959) .... Assistant Professor of History
B.A., University of Chicago; M.A., State University of Iowa;
Ph.D., University of Minnesota

Wootton, Richard T. (1964) .... Professor of Education;
Director of Financial Aids
B.S., M.S., Ed.D., University of Utah

Work, Richard N. (1965) .... Professor of Physics; Assistant Dean,
College of Liberal Arts
B.A., M.S., Ph.D., Cornell University

Wrenn, C. Gilbert (1964) .... Professor of Educational Psychology
A.B., Willamette University; M.A., Ph.D., Stanford University;
LL.D., Willamette University

Wright, Mary Lawton (1960) .... Associate Professor of Home Economics
B.S., Iowa State College; M.S., State University of Iowa

Wright, Roland M. (1963) .... Assistant Professor of Accounting
B.A., State College of Iowa; M.A., Ph.D., State University of Iowa

Wulk, Ned W. (1957) .... Assistant Professor of Health, Physical
Education and Recreation; Head Basketball Coach
B.S., LaCrosse State College; M.Ed., Xavier University

Wurzell, Carol Ann (1965) .... Instructor in Nursing
B.S., Chico State College; M.S., University of Maryland

Yale, Francis G. (1952) .... Associate Professor of Science Education
A.B., M.A., Colorado State College of Education; Ed.D., Teachers College,
Columbia University

Yeater, James W. (1958) .... Associate Professor of Speech and Drama; Director, University Players
B.A., Baker University; M.A., University of Washington; Ph.D., University of Illinois

Young, Otis E., Jr. (1963) .... Associate Professor of History
A.B., A.M., Ph.D., Indiana University

Youngblood, Barbara J. (1963) .... Instructor in English
B.A., Pacific Union College

Yuen, George U. (1957) .... Associate Professor of Chemistry
B.S., Arizona State University; Ph.D., University of Utah

Zacher, Robert V. (1947) .... Professor of Advertising
B.S. in B.A., M.S. in B.A., University of Alabama

Zaslow, Bertram (1956) .... Associate Professor of Chemistry
B.A., Cornell University; M.S., University of Minnesota; Ph.D., Iowa State University

Ziebarth, LoAnn E. (1964) .... Instructor in Nursing
B.S., University of Wisconsin; M.S., University of Minnesota

Zimmer, Carl R. (1959) .... Associate Professor of Engineering
B.E.E., Cornell University; M.E.E., Ph.D., Syracuse University

Zimmerman, J. E. (1946) .... Professor of English
A.B., M.A., Baylor University

VISITING PROFESSORS AND LECTURERS

Baird, Monica .... Lecturer in Nursing; Executive Director, Samuel Gompers Memorial Rehabilitation Center
B.A., Immaculate Heart College, Los Angeles

Barkin, Morris Ted .... Lecturer in Social Service Administration
B.S.S., City College of New York; M.S.W., Columbia University;
Ed.D., Teachers College, Columbia University

Brady, Joseph V. .... Lecturer in Psychology
B.S., Fordham University; Ph.D., University of Chicago

Cain, H. Thomas .... Lecturer in Anthropology
A.B., University of Washington; M.A., Harvard University

Campbell, Roy Hilton .... Lecturer in Marketing
M.B.A., University of Chicago

Carroll, Florence .... Lecturer in Nursing; Administrative Nurse, Crestview Convalescent Lodge
R.N., Columbia Hospital School of Nursing, Wilkinsburg, Pennsylvania

Carson, Albert B. .... Visiting Professor of Accounting
A.B., Colorado College; M.B.A., Northwestern University;
Ph.D., University of Nebraska

Coblentz, Harry S. .... Lecturer in Architecture
B.A., Durham University; M.R.P., University of North Carolina

Cochran, Douglas L. .... Lecturer in General Business Administration
B.S. in B.A., Ohio State University, M.B.A., Harvard University

Cook, Margaret .... Lecturer in Nursing; Director of Nursing, Memorial Hospital
R.N., Mound's Midway Hospital School of Nursing, St. Paul, Minnesota

Cullum, Leslie E. .... Lecturer in Zoology; Head Curator, Animal Resources Center

Demson, Edward J. .... Lecturer in General Business Administration
A.B., LL.B., Ohio State University

Douthit, J. C. .... Lecturer in Construction
B.E.E., University of Arkansas; M.A. in Ed., Arizona State University

Driska, Robert .... Lecturer in Office Administration and Business Education
B.B.A., M.Ed., University of Texas

Eidelberg, Eduardo .... Lecturer in Psychology
B.S., M.D., National University, Lima, Peru

Emerick, Paul L., Jr. .... Lecturer in General Business Administration
B.M.E., Rensselaer Polytechnic Institute; B.S.C., Salmon P. Chase College;
M.B.A., Xavier University

Ferster, Charles B. .... Lecturer in Psychology
B.S., Rutgers University; M.A., Ph.D., Columbia University

Fleming, Donovan E. ... Lecturer in Psychology
B.S., M.S., Brigham Young University; Ph.D., Washington State University

Gabrielson, Rosamond ... Lecturer in Nursing;
Director of Nursing, Good Samaritan Hospital
R.N., Hotel Dieu School of Nursing, El Paso, Texas;
B.S., M.A., Arizona State University

Gerrard, Dorothy ... Lecturer in Nursing;
Executive Director, Visiting Nurse Service, Inc.
R.N., St. Paul's Hospital School of Nursing, Vancouver, B.C.; P.H.N. Certificate,
University of British Columbia; B.S.N.E., University of Oregon;
M.S. in Ph.N., University of Colorado

Glascock, Rhoeine ... Lecturer in Nursing
Director of Nursing, Maricopa County General Hospital
R.N., University of Michigan; B.S. in Hospital Administration, Northwestern University

Gonzales, Bennie M. ... Lecturer in Architecture
B.S., Arizona State University

Green, Helen Hinkson ... Visiting Professor of Office Administration
and Business Education
M.Bus.Ed., University of Colorado; Ed.D., Michigan State University

Green, John R. ... Lecturer in Zoology
B.S., College of Puget Sound; M.B., M.D., Northwestern University

Gruber, Gabriel ... Lecturer in Music
Diploma, Juilliard School of Music

Haeussler, William B. ... Lecturer and Consultant in Nursing
B.A., M.D., University of Pennsylvania

Harris, Joseph ... Lecturer in Chemistry
B.S., University of Maryland; M.A., Ph.D., Johns Hopkins University

Harvey, Alfred Dallas ... Lecturer in Construction
B.S., University of Illinois

Harvey, Martha ... Lecturer in Nursing;
Acting Director of Nurses, Arizona State Tuberculosis Sanatorium
R.N., J. C. Blair Memorial Hospital School of Nursing, Huntingdon, Pennsylvania

Janecek, Mary ... Lecturer in Nursing;
Director of Nursing, St. Luke's Hospital
R.N., B.S., University of Rochester School of Nursing, Rochester, New York

Kennedy, John J. ... Lecturer in General Business Administration
B.S., Yale University; M.B.A., Harvard University

Koerber, Vendeta ... Lecturer in Nursing;
Director of Nursing, Kivel Nursing Home
R.N., Wichita Hospital School of Nursing, Wichita, Kansas

Lu, Pao ... Visiting Assistant Professor of Physics
B.S. in E.E., National Taiwan University; M.S., National Tsing Hua University;
Ph.D., Iowa State University

Macek, Elizabeth ... Lecturer in Nursing;
Director of Nurses, White Angel Hospital
R.N., St. Luke's School of Nursing, Cleveland, Ohio

Minter, Marshall R., Jr. ... Lecturer in Industrial Technology
B.S.M.E., Purdue University

McFee, June K. ... Visiting Associate Professor of Art
B.A., University of Washington; M.Ed., Central Washington College;
Ed.D., Stanford University

Mokma, Cornelia ... Lecturer in Nursing;
Chief, Nursing Service, Veteran's Administration Hospital, Phoenix
R.N., Presbyterian Hospital School of Nursing, Chicago; A.B., Central College

O'Connell, Joy ... Lecturer in Nursing;
Head Nurse, Mesa Public Schools
R.N., St. Francis School of Nursing, La Crosse, Wisconsin;
B.S.N., Arizona State University

Prieto, Roselyn Y. ... Lecturer in Nursing;
Director of Nursing, Crippled Children's Hospital
R.N., Hospital of the Holy Family School of Nursing, New York

Pyle, William W. ... Lecturer in Accounting
B.S., M.S., Indiana State Teachers College

Quinn, Martin W. ... Lecturer in Construction
B.S., Arizona State University

Reilly, William A. .... Lecturer in Nursing
A.B., University of California, Berkeley; M.D., University of California School of Medicine, San Francisco

Rice, Margaret Jane .... Lecturer in Speech
A.B., M.A., University of Kansas

Schwartz, Arthur S. .... Lecturer in Psychology
B.A., New York University; Ph.D., University of Buffalo

Sherwood, Margaret .... Lecturer in Nursing;
Director of Nursing Service, St. Joseph's Hospital
R.N., University of Minnesota School of Nursing, Minneapolis

Soleri, Paolo .... Lecturer in Architecture
Professol of Design, Licero Artistico Torino; Dottore in Architettura, Politechnic of Turin

Sun, David C. H. .... Lecturer in Zoology
B.S., M.D., St. John's University; M.Sc., D.Sc., University of Pennsylvania

Tikkala, Vellamo .... Lecturer in Nursing;
Director of Nursing, Doctor's Hospital
R.N., Burbank Hospital School of Nursing, Fitchburg, Massachusetts; B.S., Arizona State University

Van Reusen, Karel .... Lecturer in Construction
B.S., Middelb Technical School (Amsterdam)

Weed, Jane Larue .... Lecturer in Nursing;
Director of Nursing, Arizona State Hospital
R.N., St. Mark's Hospital School of Nursing, Salt Lake City, Utah; B.S., University of Utah; M.S., University of Colorado

White, Philip T. .... Lecturer in Psychology
M.D., George Washington University

Wiik, Hugo Birger .... Visiting Professor of Chemistry
M.A., Ph.D., University of Helsinki

Wilson, Mary .... Lecturer in Nursing;
Director, Public Health Nursing, Maricopa County Health Department
R.N., Henrotin Hospital School of Nursing, Chicago; B.S., Loyola University, Chicago; M.P.H., University of Michigan

Yellott, John Ingle .... Lecturer in Architecture
B.S., M.M.E., Johns Hopkins University

TRAINING SCHOOL

Doyle, Roy P. (1959) .... Director, I. D. Payne Training School;
Professor of Education
B.A. in Ed., Arizona State University; M.A., Ed.D., Columbia University

Ashby, Nancie I. (1948) .... Lunchroom Supervisor

Bryan, Ruth D. (1956) .... Seventh Grade
B.Ed., M.S., Southern Illinois University

Chubbuck, John D. (1964) .... Fifth Grade
B.A. in Ed., M.A. in Ed., Arizona State University

Kirkpatrick, Jane (1958) .... School Nurse
R.N., St. Mary's Hospital, Tucson

Law, Marjorie W. (1957) .... Physical Education
B.A. in Ed., M.A. in Ed., Arizona State University

Moore, Hope C. (1956) .... Shop and Physical Education
B.A. in Ed., M.A. in Ed., Arizona State University

Richardson, Norma S. (1961) .... Second Grade
B.A., M.A., Arizona State University

Schall, Mary H. (1960) .... First Grade
A.B., Albion College; M.A. in Ed., Arizona State University

Searight, Roland (1954) .... Music
B.A., Grinnell College; M.A., The Eastman School of Music of the University of Rochester

Smith, Gladys Arlene (1954) .... Fourth Grade
B.S. in Ed., Ft. Hays Kansas State College; M.S. in Ed., University of Kansas

Stansell, William E. (1956) .... Sixth Grade
B.S., Milwaukee State Teachers College; M.E., Wisconsin State College

Steere, Caryl J. (1960) .... Kindergarten
B.A., Albion College

Verner, Erva J. (1959) .... Eighth Grade
B.A., University of Wisconsin; M.A. in Ed., Arizona State University

Wootton, Mary Lee (1962) .... Third Grade
B.S. in Ed., University of Southern California; M.A. in Ed., Arizona State University

UNIVERSITY LIBRARY

Covey, Alan D. (1962) .... University Librarian
Professor of Library Science
A.B., Certificate in L.S., University of California, Berkeley;
Ed.D., Stanford University

Acklin, Pauline (1955) .... Catalog Librarian
B.A., B.S. in L.S., Texas State College for Women

Arko, Mary L. (1958) .... Catalog Librarian
B.S. in L.S., University of Minnesota

Beckwith, Herbert H. (1962) .... Reference Librarian
B.A., Lake Forest College; M.S.L.S., University of North Carolina

Beecher, Mary E. (1958) .... Catalog Librarian
B.A., State College of Iowa; M.A., State University of Iowa

Chin, Tieh-Cheng (1964) .... Documents Librarian
B.A., National Northeastern University (Santal, China);
M.A., M.L.S., University of Washington

Haskell, Donna M. (1963) .... Head Catalog Librarian
B.S. in Educ., Kansas State Teachers College; A.M.L.S., University of Michigan

Howe, Charles Edward (1951) .... Librarian, Architectural Branch
B.D., Bexley Hall, Kenyon College

Marshall, Thomas H. P. (1964) .... Reference Librarian
B.S., M.S., Michigan State University; M.L.S., University of California, Berkeley

McGrath, Afton L. (1963) .... Reference Librarian
B.A. in Ed., Arizona State University; M.L.S., University of California, Berkeley

Mills, Helen L. (1965) .... Catalog Librarian
B.A., University of California, Davis

Morgan, Florence B. (1950) .... Catalog Librarian
B.A., University of Colorado; B.S. in L.S., University of Illinois;
M.S., Columbia University

Mueller, Twyla Wilma (1959) .... Head Acquisitions Librarian
B.A., University of Toledo; M.S.L.S., Western Reserve University

Muir, Gertrude F. (1960-62; 1963) .... Special Collections Librarian
B.A., M.A., University of Arizona; B.S. in L.S., University of Denver

Nelson, Jerold A. (1964) .... Interlibrary Loan and Reference Librarian
B.A., M.A., University of Minnesota

Pady, Donald Stuart (1963) .... Catalog Librarian
B.A., University of Kansas; M.S. in L.S., Kansas State Teachers College

Pennington, B. Blaine (1964) .... Administrative Assistant
to University Librarian
B.A., M.A., University of Kansas City; M.A. in L.S., University of Denver

Phillips, Ruth F. (1948) .... Catalog Librarian
B.A., Cornell College; Certificate in L.S., University of Wisconsin

Pooley, Eleanor L. (1963) .... Acquisitions Librarian
B.A., Coe College; M.L.S., Rutgers, The State University

Rawson, Ruth P. (1958) .... Reference Librarian
B.S., Certificate in L.S., University of Minnesota

Ruppé, Carol V. (1962) .... Reference Librarian
B.A., University of New Mexico; M.A., University of Denver

Sanderson, John E. (1964) .... Head, Serials Department
A.B., Susquehanna University; B.D., Theological Seminary;
B.L.S., Columbia University

Schommer, Patricia O. (1965) .... Catalog Librarian
B.A., M.A.L.S., College of St. Catherine

Smith, Xenophon P. (1964) .... Head of Loan Service
B.A., University of Kansas; B.A., University of Washington;
M.A., Oregon State University

Watrous, Lyle C. (1962) .... Reference Librarian-Education
A.B., Woman's College, University of North Carolina; B.S. in L.S., Carnegie Library School, Carnegie Institute of Technology; Certificate in L.S., Southern Connecticut State College

Wurzburger, Marilyn Jo (1960) .... Catalog Librarian
A.B., MacMurray College

Young, Ai-Hwa (1964) .... Catalog Librarian
B.A., National Taiwan University; M.L., University of Washington

STUDENT HEALTH SERVICE

McFarland, Elaine, M.N., C.P.H.N. .... Director, Student Health Service

Dorner, Arthur F., M.D. .... Medical Director, Student Health Service

Baum, William S., M.D. .... University Physician, Student Health Service

Gentner, George A., M.D. .... Consulting Roentgenologist
Student Health Service

Schramel, John E., M.D. .... Medical Consultant, Student Health Service

Scott, Woodrow W., M.D. .... University Physician, Student Health Service

Watson, Ernest S., M.D. .... University Physician, Student Health Service

COLLEGES, SCHOOLS, DIVISIONS AND DEPARTMENTS

College of Liberal Arts	Karl H. Dannenfeldt, Dean
College of Architecture	James W. Elmore, Dean
College of Business Administration	Glenn D. Overman, Dean
College of Education	G. D. McGrath, Dean
College of Engineering Sciences	Lee P. Thompson, Dean
School of Engineering	Lee P. Thompson, Director
Division of Agriculture	Daniel O. Robinson, Director
Division of Industrial Design and Technology	Walter E. Burdette, Director
College of Fine Arts	Henry A. Bruinsma, Dean
College of Law	
College of Nursing	Loretta A. Hanner, Dean
Graduate College	William J. Burke, Dean
Graduate School of Social Service Administration	Horace W. Lundberg, Dean
Summer Sessions and Extension	Roy C. Rice, Dean

DEPARTMENTS OF INSTRUCTION

Accounting	William Huizingh, Chairman
Aerospace Studies	Lt. Col. Robert W. Edwards, Chairman
Agriculture	Daniel O. Robinson, Director
Anthropology	Reynold J. Ruppe, Chairman
Architecture	James W. Elmore, Dean
Art	Harry Wood, Chairman
Botany	James E. Canright, Chairman
Chemistry	LeRoy Eyring, Chairman
Counseling and Educational Psychology	Sandford S. Davis, Chairman
Economics	John A. Cochran, Chairman
Educational Administration and Supervision	Raymond E. Wochner, Chairman
Educational Foundations	Mack A. Ralston, Chairman
Educational Services	Willard Abraham, Chairman
Elementary Education	Richard E. Bullington, Chairman
Engineering	Lee P. Thompson, Dean
Chemical Engineering Faculty	Castle O. Reiser, Chairman
Civil Engineering Faculty	Robert D. Kersten, Chairman
Electrical Engineering Faculty	Truet B. Thompson, Chairman
Engineering Science Faculty	C. E. Wallace, Chairman
Industrial Engineering Faculty	C. G. Gambrell, Chairman
Mechanical Engineering Faculty	George C. Beakley, Chairman
English	Jerome W. Archer, Chairman
Foreign Languages	Herbert A. Van Scoy, Acting Chairman
General Business Administration	Joel J. Dauten, Chairman
Geography	L. Lloyd Haring, Chairman
Geology	Troy L. Pewe, Chairman

Health, Physical Education and Recreation	Clyde B. Smith, Chairman
History	Paul G. Hubbard, Chairman
Home Economics	Bertha M. Bresina, Chairman
Industrial Design and Technology	Walter E. Burdette, Director
Library Science	Harold W. Batchelor, Chairman
Management	Harold Fearon, Acting Chairman
Marketing	George D. Downing, Chairman
Mass Communications	Marvin H. Alisky, Chairman
Mathematics	Evar D. Nering, Chairman
Military Science	Col. Coy L. Curtis, Chairman
Music	Henry Bruinsma, Chairman
Nursing	Loretta A. Hanner, Dean
Office Administration and Business Education	Donald J. Tate, Chairman
Philosophy	Robert L. Rein'l, Chairman
Physics	Richard G. Stoner, Chairman
Political Science	John P. White, Chairman
Psychology	Arthur J. Bachrach, Chairman
Secondary Education	Billie J. Fullerton, Chairman
Social Service Administration	Horace W. Lundberg, Dean
Sociology	Thomas F. Hoult, Chairman
Speech and Drama	James W. Yeater, Acting Chairman
Zoology	Gordon L. Bender, Acting Chairman

STUDENT PERSONNEL OFFICERS

Dean of Students	Weldon P. Shofstall
Associate Dean of Students	Catherine G. Nichols
Dean of Men	George F. Hamm
Assistant Dean of Students	Robert G. Bradford
Assistant Dean of Men	Russell O. Bloyer
Assistant to the Associate Dean of Students	Jo F. Dorris

RESEARCH AND SERVICE AGENCIES

Audiovisual Center	Joel A. Benedict, Director
Broadcasting, Bureau of	Robert H. Ellis, Director
Business Research and Services, Bureau of	Ralph C. Hook, Director
Computer Center (Engineering Center)	Lee P. Thompson, Director
Data Processing Center (Moeur Building)	Reed W. Young, Manager
Educational Research and Services, Bureau of	R. Merwin Deever, Director
Engineering Research Center	Lee P. Thompson, Director
Government Research, Bureau of	Leonard E. Goodall, Director
Meteoritic Research, Laboratory for	Carleton B. Moore, Director George A. Boyd, Associate Director

News Bureau	Joseph E. Spring, Chief
Placement Center	Robert F. Menke, Director
Poisonous Animals Research Laboratory	Herbert L. Stahnke, Director
Publications, Bureau of	Dean E. Smith, Director
Student Health Center	Elaine McFarland, Director
University Testing Service	Richard E. Schutz, Director

ADMISSIONS AND REGISTRATION

Registrar and Director of Admissions	Alfred Thomas, Jr.
Associate Director of Admissions	
Associate Registrar	Galen H. Cassity
Assistant Registrar	Keith V. Breon
Assistant Director of Admissions	Ann J. Kolberg

MEMORIAL UNION

Director of Memorial Union	Cecelia Scoular
Assistant Director	Trudy Thomas

RESIDENCE HALLS

Director of Housing	Edward M. Hickcox
Assistant Director of Housing	Robert E. Troxell
M. O. Best "A"	Corky Schilt, Head Resident
M. O. Best "B"	J. Vincent Madden, Head Resident
Haigler Hall	Floyd Martin, Head Resident
Irish Hall	Lawrence Cole, Head Resident
Hayden Hall	Robert Berger, Head Resident
Wilson Hall	Mrs. Irene Hanney, Head Resident
Sahuaro Residence Halls	Ken Calbeck, Jr., Director
Sahuaro A	Jerry Eppler, Head Resident
Sahuaro B	Elwood Bent, Head Resident
Sahuaro C	John Avianantos, Head Resident
Adelphi 1	J. Kenneth Margraf, Adviser
Adelphi 2	Woodrow W. Carter, Adviser
Adelphi 3	John Nichol, Adviser
Adelphi 4	Robert W. Chamberlain, Jr., Adviser
Adelphi 5	Mark Cockrell, Adviser
Quadrangle (North, South, West)	Paula Eisenman, Head Resident
Gammage Hall	Mrs. Dorothy Shumway, Head Resident
McClintock A	Mrs. Elsie Phillips, Head Resident
McClintock B	Miss Sharyl Moomaw, Head Resident
Palo Verde Hall	Miss Margaret McCandless, Director
Palo Verde East	Mrs. P. Charlotte Lewis, Head Resident
Palo Verde West	Miss Mary Ruth Culbert, Head Resident

BUSINESS AFFAIRS AND PHYSICAL PLANT

Vice President for Business Affairs	Gilbert L. Cady
Comptroller	Charles E. LaDue
Associate Comptroller	William J. Curran
Assistant Comptroller	Jack R. Armstrong
Purchasing Agent	George W. Morrell
Office Manager	Henry Spomer, Jr.
Bookstore Manager	Tony Bustamente
Director of Physical Plant	John R. Ellingson, Sr.
Administrative Assistant, Physical Plant	Marc W. LeMieux
Assistant to the Director, Physical Plant	Arthur R. Garrett
Plant Engineer	George J. Zelenski
Foreman of Custodian Service	William E. Henrie
Supervisor of Motor Pool	Andrew P. Mills
Director of Campus Security	John B. Duffy
Assistant Director of Campus Security	Gayle Shuman

UNIVERSITY DEVELOPMENT

Director	Dean E. Smith
Assistant Director	Kathryn K. Gammage

ALUMNI ASSOCIATION

Executive Secretary	James W. Creasman
Acting Executive Secretary	Donald V. Dotts
Assistant Executive Secretary	Warren K. Sumners

ARIZONA STATE UNIVERSITY FOUNDATION

OFFICERS

President	J. C. Wetzler
First Vice President	W. W. Knorpp
Second Vice President	John B. Mills
Secretary	Sidney B. Moeur
Associate Secretary	Kathryn K. Gammage
Treasurer	Orval Knox

BOARD OF DIRECTORS

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Daniel Noble
Earl Recker
Lewis J. Ruskin
Don Stewart
Lyle Trimble
J. C. Wetzler

ORGANIZATION, HISTORY AND GENERAL INFORMATION

OBJECTIVES

Arizona State University aims to educate for leadership and responsible citizenship in the United States of America and other free societies. Increased competence, improved moral and ethical standards, expanded cultural horizons, and enhanced ability to seek answers to the fundamental questions of broadest human concern, are the objectives of the University.

ORGANIZATION

Arizona State University, established in 1885 as the Arizona Territorial Normal School, is one of three major institutions governed by the State Board of Regents. Appointed by the Governor of the State, the Regents serve the University of Arizona (Tucson), Arizona State College (Flagstaff), (to be known as Northern Arizona University in 1966), and Arizona State University.

The Regents select and appoint the President of the University, who is the chief executive officer and the regular means of communication between the Board of Regents and the institution. The President is aided in the administrative work of the institution by Vice Presidents, Deans, Faculties, Directors, Departmental Chairmen and other officers. The faculties of the University play an important role in educational policy, with a Faculty Senate and other University councils serving the needs of a large institution.

Arizona State University is organized into Colleges of Liberal Arts, Architecture, Business Administration, Education, Engineering Sciences, Fine Arts, Law (1967) and Nursing; Divisions of Agriculture and Industrial Design and Technology; a Graduate School of Social Service Administration; Summer Sessions and Extension Division; a Graduate College, and 50 departments of instruction. These academic agencies carry the major teaching, research and service programs of the University.

The undergraduate and graduate degree programs of the University are outlined in detail in later sections of this Catalog.

HISTORY OF ARIZONA STATE UNIVERSITY

On February 26, 1885, House Bill 164, An Act to Establish a Normal School in the Territory of Arizona, was introduced in the Thirteenth Legislative Assembly of Arizona Territory by John Samuel Armstrong. The bill, strongly supported by Charles Trumbull Hayden of Tempe, passed the House on March 6, the Council on March 11, and was signed by Governor F. A. Tritle on March 12, 1885. Thus came into existence the institution today known as Arizona State University.

Instruction was instituted on February 8, 1886, when 33 students met in a single room under the supervision of Hiram Bradford Farmer.

The institution began with the broad obligation to provide "instruction of persons . . . in the art of teaching and in all the various branches that pertain to a good common school education; also, to give instruction in the mechanical arts and in husbandry and agricultural chemistry, the fundamental law of the United States, and in what regards the rights and duties of citizens."

With the growth of the state, especially the surrounding Phoenix metropolitan area, the school has carried forward this charter, accompanied by successive changes in its scope, name and government. On March 9, 1945, the three state institutions of higher learning came under the authority of one Board of Regents. By vote of the people, on November 4, 1958, the name Arizona State University replaced the previous name, Arizona State College.

ACCREDITATION AND AFFILIATION

Arizona State University is accredited by the North Central Association of Colleges and Secondary Schools. Professional programs in the various colleges, schools, divisions and departments are accredited by the corresponding national bodies. Arizona State University is a member of the National Association of State Universities and Land Grant Colleges, is affiliated with the American Council in Education and other international, national and regional associations.

UNIVERSITY CAMPUS

ENVIRONMENT

Location. Arizona State University is in the heart of metropolitan Phoenix in the city of Tempe. Within a few minutes' drive of the campus are the municipalities comprising the fast-growing Phoenix area—Scottsdale, Mesa, Chandler, Gilbert, Glendale, Litchfield Park, Peoria and other communities.

Historical and Scenic Features. Within easy reach are found such landmarks as Apache Trail, the man-made lakes of the Salt River Project, Roosevelt and Coolidge Dams, Hieroglyphic Canyon, and the Casa Grande National Monument. Somewhat more distant are the internationally famous Grand Canyon of the Colorado, Glen Canyon Dam, scenic Oak Creek Canyon, and other famed western beauty spots.

The Navajo, Apache, and Hopi Indian Reservations are near enough for occasional visits. Smaller tribal groups—the Pimas, Maricopas, and Yaquis—live but a few miles from the campus. At the Heard Museum in Phoenix and in the original excavations at Pueblo Grande, five minutes from the campus, the superb art of ancient basket-weavers and sun-worshipping Ho-Ho-Kams may be studied.

GROUNDS

Campus. Most of the 70 major buildings on the 300-acre main campus have been erected during the past 15 years. Broad lawns and sub-tropical trees provide year-round greenery.

University Farm. The model farm of 320 acres is located six miles southwest of the campus. It is used for experimental and practical work in various phases of agricultural science pertaining to modern farm management.

UNIVERSITY LIBRARIES AND COLLECTIONS

Matthews Library (1930). A growing collection of materials meets the needs of undergraduate and graduate students and faculty. Enlarged in 1951, the library has a seven-level book stack plus public and private reading rooms. A collection of 450,000 books, nearly 60,000 periodicals and microfilm and microcard materials are housed here. At present, Matthews Library also houses the Collection of American Art.

University Library. To be completed in the fall of 1966, the new structure is designed for more than one million volumes.

Curriculum Laboratory. Housed in Matthews Library, the Laboratory is a functional part of the teacher education program of the University. It serves both in-training and in-service teachers with collections of teaching materials and curricula.

Architecture Library. Contains 5,000 books on architecture and construction, current and bound periodicals in related fields; located in the Engineering Center.

Audiovisual Library. Arizona's largest film library is in Matthews Hall and includes 5,000 films.

Bureau of Broadcasting Library. An extensive recording library is located in the Engineering Center.

Music Research Facility. A collection of 1,200 music scores, books and periodicals is in Room 209, Grady Gammage Memorial Auditorium.

Solar Research Service Center, Solar Energy Society. Papers on applied solar energy from scientists all over the world are on file in this facility in the Engineering Center.

I. D. Payne Campus Laboratory School Library. A children's library containing 5,000 carefully selected books. Pamphlets, pictures, periodicals and textbooks supplement the collection.

UNIVERSITY BUILDINGS

Administration Building (1951). The office of the President and other major administrative officials are located here.

Agriculture Building (1950). Division of Agriculture and Departments of Geology and Geography.

Alumni House (1907). Headquarters of Alumni Association.

Arts Building (1914). Art Department.

Business Administration Building (1951). College of Business Administration.

Hiram Bradford Farmer Education Building (1961). College of Education.

Engineering Center (1955). Colleges of Engineering Sciences and Architecture, the ASU Computer Center, and KAET television station.

English Building (1909).

Forest Hydrology Building (1964). Rocky Mountain Forest and Range Experiment Station of the U. S. Forest Service.

Home Economics Building (1951). Department of Home Economics.

Home Management House and Nursery School (1939).

Industrial Design and Technology Building (1964). Division of Industrial Design and Technology.

Language and Literature Building (1965). Departments of English, Speech and Drama, and Foreign Languages.

Life Sciences Center (1959). Botany and Zoology Departments; Poisonous Animals Research Laboratory.

Lyceum Building (1939). Speech and drama workshop; University Players theater.

Moeur Administration Building (1946). Registrar, Director of Admissions and Records, Housing Office and Data Processing Service.

Old Main (1894). Aerospace Studies and Military Science.

I. D. Payne Campus Laboratory School (1914). Campus laboratory school for education majors and minors.

Physical Sciences Center (1959). Departments of Mathematics, Chemistry, Physics, and the Laboratory for Meteoritic Research with its Nininger Meteorite Collection and other samples.

Social Sciences Building (1960). College of Liberal Arts; the Anthropological Museum and Psychological Clinic.

Nursing Building (under construction).

Physical Education Building (1952). Health, Physical Education and Recreation Department.

Goodwin Stadium (1936). Used for intramurals, track and field meets, physical education classes.

Sun Devil Stadium (1958). Intercollegiate athletic events; capacity is 30,000 spectators, with temporary seating for an additional 10,000.

Swimming Pool (1957).

Women's Physical Education Building (under construction).

RESIDENCE HALLS

Housing for Women

- Quadrangle:
  - South (1913)
  - North (1914)
  - West (1936)
- Dixie Gammage Hall (1941)
- James H. McClintock "A" (1951)
- James H. McClintock "B" (1956)
- George W. Wilson (1956)
- Palo Verde (1958)
- Palo Verde East (1963)
- Palo Verde West (1964)

Housing for Men

- Frederick M. Irish (1940)
- M. O. Best (1956)
- Charles Trumbull Hayden (1951)
- Sahuaro (1958)

Adelphi Housing (1954): Five units for small-group housing.
Fraternity Housing (1962): Ten units for small-group housing.

EDUCATIONAL RESOURCES AND SERVICES

Grady Gammage Memorial Auditorium. Designed by Frank Lloyd Wright and named for the late President Gammage, this versatile auditorium seats 3,000. The building was dedicated in September, 1964, and has won wide acclaim for its design and acoustics. The College of Fine Arts is headquartered here.

The Arizona State University Collection of American Art. The collection, on display in Matthews Library, includes paintings in oil, water color and tempera, as well as numerous works of sculpture, ceramics and an extensive print collection. Founder of the collection was the late Oliver B. James.

The Lewis and Lenore Ruskin Collection. Renaissance and 17th Century paintings presented to the University by Lewis and Lenore Ruskin. The collection hangs in the Regents Room, Administration Building, where it is open to the public.

Center For the Study of Higher Education. The purpose of the Center is that of coordinating present and potential resources of the institution on a University-wide basis to provide maximum leadership in graduate instruction, research and development within the area of higher education, and to provide field service to the junior colleges, colleges and universities of the region.

Graduate programs are offered for college teachers and college personnel workers and for college and university administrators.

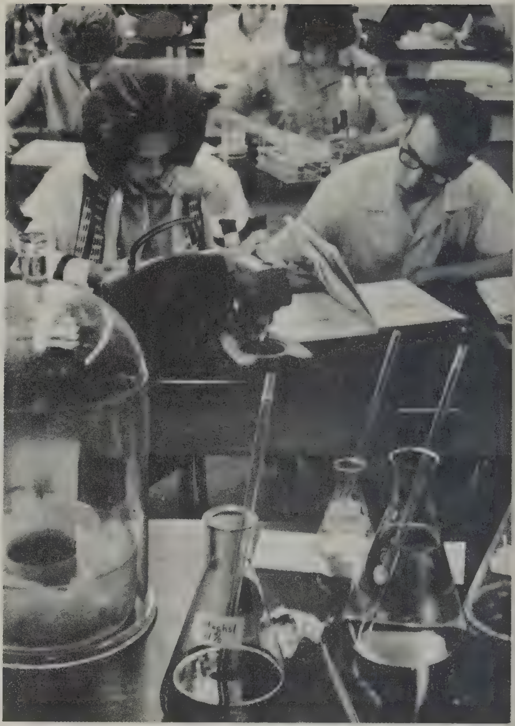
University Computer Center. Located in the Engineering Center, the University Computer Center serves faculty research, teaching, and experimental needs.

Data Processing Service. The Data Processing Service is a campus service bureau organized to serve University operations. It is designed to also serve additional institutional and educational needs of the University.

Bureau of Broadcasting. Radio Facilities—The Bureau operates a professionally equipped broadcasting unit, KASN, located in the Engineering Center, to serve the teaching program in radio skills.

Television Facilities—The Bureau operates Arizona State University's educational television station, (KAET, Channel 8). These facilities are used for training students in television skills in addition to telecasting of educational programs to the general public.

Audiovisual Center. The Audiovisual Center includes the Educational Graphic Arts Service, the Photographic Service and the film library. The Center is housed in Matthews Hall. The library is the largest collection of films in Arizona. Its 5,000 films are cooperatively owned by approximately 73 member schools, by ASU and by governmental agencies and industries which deposit films in the library.



ADMISSION, ACADEMIC STANDARDS AND GRADUATION

Age. All applicants for admission to Arizona State University must be at least 16 years of age.

Character. All new students are required to furnish satisfactory evidence of good character as evidenced by a certificate of graduation or of honorable dismissal from the school last attended.

Health. Prior to registration, every new student or former student who has not been in attendance at Arizona State University for a year or more must furnish the Student Health Service with a record of physical examination. For details see page 84 under heading "Health Service."

Aptitude Test. All entering students are required to take a general academic aptitude test prior to admission or registration. Arizona high school applicants may meet this requirement by taking the American College Test in their senior year under the program approved by the Arizona Secondary School Principals' Association and the Arizona High School Superintendents' Association, and by requesting that a report of the scores be sent to the Admissions Office of Arizona State University. Entering students may be required to take other tests for placement purposes authorized by Arizona State University.

Arizona State University reserves the right to deny admission or cancel registration of an individual whose attendance at Arizona State University in the opinion of the appropriate administrative officer and the President, would not be mutually beneficial to himself and to the institution.

ADMISSION TO ARIZONA STATE UNIVERSITY

The first phase of admission is admission to the institution. The second phase is admission to freshman standing in a curriculum of a particular college, school, division, or department within the institution.

Application For Admission. Inquiry regarding application for admission should be directed to the Registrar and Director of Admissions. To make formal application for admission, a student should submit a completed application blank to the Admissions Office, and should have his high school registrar or principal forward to the Admissions Office a transcript of his high school record. A preliminary application for admission may be filed any time during the second semester of the senior year, provided that a supplementary transcript be submitted following high school graduation.

GRADUATES FROM AN APPROVED SECONDARY SCHOOL

All applicants for admission to the institution must have graduated with satisfactory scholarship from an accredited secondary school and must have completed a 4-year secondary-school course or the equivalent with a minimum of sixteen units in acceptable subjects. The definition of a unit is that used by the North Central Association of Colleges and Universities.

SCHOLARSHIP REQUIREMENTS

Regular Admission. Students must offer an acceptable program of secondary school subjects and must have ranked in the upper three-quarters of their graduating class.

Provisional Admission. Students offering an acceptable program of subjects but ranking in the lower one-fourth of their high school graduating class may apply for provisional admission. Such applicants may be granted provisional admission only after pre-admission counseling and testing in which they give evidence of ability to carry college work successfully.

Non-resident Admission. Applicants for admission from accredited secondary schools will be considered for admission if the transcript shows that the applicant has been graduated and has completed an acceptable program of secondary school subjects (as recommended below) and has ranked at least in the upper two-thirds, preferably the upper one-half, of his graduating class. Satisfactory College Entrance Examination Board scores (Scholastic Aptitude Test) are an acceptable substitute for rank in the graduating class.

Advanced Placement. Students who have taken college level courses in secondary schools and have taken the Advanced Placement Examination will be considered for advanced placement and for the granting of college credit to count towards degree requirements.

CLASSIFICATION OF ACCEPTABLE SECONDARY SCHOOL SUBJECTS

Group I. English: only courses with major emphasis upon grammar, composition and literary analysis.

Group II. Foreign Language: a classical or modern foreign language. Less than one unit is not accepted. Two units or more are strongly recommended.

Group III. Mathematics: one unit of algebra and one unit of mathematics other than arithmetic, business mathematics or general mathematics.

Group IV. Social Studies: history, civics, economics, sociology, geography, and government (including United States and Arizona constitution).

Group V. Laboratory Science: only courses in biology, chemistry, and physics, in which at least one regular laboratory period is scheduled each week.

Group VI. Art, agriculture, bookkeeping, general science, home economics, arithmetic, business arithmetic, general mathematics, journalism, industrial arts, music, drama and speech, secretarial training, and other subjects commonly offered for credit by secondary schools, except physical education and military science.

RECOMMENDED SECONDARY SCHOOL SUBJECT UNITS

English	4		(from Group I)
or English 3 and one Foreign Language 2		5	(from Groups I and II)
Mathematics	2	2	(from Group III)

American History and Social Studies	2	2	(from Group IV)
Laboratory Science	2	2	(from Group V)
Electives	6		(from Groups I through VI)
depending upon English option		5	
	16	16	

ADDITIONAL SUBJECT UNITS RECOMMENDED

The recommended pattern of subjects is that which on the basis of experience can reasonably be expected to provide satisfactory preparation for college when these subjects have been completed with better than average grades. *Academically talented students are strongly urged to take additional courses from Groups I through V beyond those recommended above.*

ADMISSION TO FRESHMAN STANDING

The recommended program of secondary school subject units meets the requirements for admission to freshman standing in the Colleges of Liberal Arts, Education, Business Administration, Engineering Sciences and Nursing except in Engineering and Architecture.

In the School of Engineering 3½ units are required in mathematics. Included must be: advanced algebra, geometry, and trigonometry. Calculus is recommended. The two units of required laboratory science are one in chemistry and one in physics.

In the College of Architecture, mathematics must include algebra, advanced algebra and geometry for a total of 2½ units; laboratory sciences must include one unit of physics and one unit of chemistry; additional units recommended include geometry, trigonometry, art and drawing.

PROVISIONS FOR ADMISSION FOR SECONDARY SCHOOL GRADUATES WHO HAVE NOT COMPLETED THE RECOMMENDED SUBJECT UNITS

Applicants who lack no more than two units of the recommended program may be admitted with deficiencies. Credit for college courses applied to deficiencies is not applicable to degree requirements.

APPROVED ARIZONA HIGH SCHOOLS

The high schools of the state are classified in four divisions—North Central Association high schools, Class A high schools, Class B high schools, and approved private schools. Graduates of these schools are accepted without examination under the foregoing provisions governing admission.

ADMISSION WITH ADVANCED STANDING

Application for Admission. Inquiry regarding application for admission must be directed to the Registrar and Director of Admissions. To make formal application for admission, a student should submit a completed application blank to the Admissions Office.

Transcripts. Before any student may register for work in the regular sessions of Arizona State University and be admitted to advanced standing and classification, his transcripts of high school and previous college work must be on file in the Office of the Registrar and Director of Admissions.

Students should request the high school principal and each college registrar to mail their transcripts directly to the Registrar and Director of Admissions. Transcripts should be in the hands of the Registrar and Director of Admissions at least thirty days in advance of the registration date. Transfer students whose transcripts are not received by this date may experience difficulty in planning course programs with curriculum advisers. Transcripts are not required at the time of registration of those taking work in the summer session, in extension, or by correspondence.

All transcripts or credentials submitted from other institutions become the property of Arizona State University. Neither the originals nor copies will be released from the files. When duplicates are required students should obtain new transcripts from the issuing institution. At the discretion of the administration of Arizona State University, admissions credentials and transcripts will be destroyed.

Transfer of Credit. Credentials presented for admission may be rejected in whole or in part and examinations required in any or all of the subjects offered. Applicants who have failed to maintain a satisfactory scholarship record acceptable to the University will not be admitted. However, students who have been disqualified in another institution because of scholarship, conduct, or other reasons, where there may have been extenuating circumstances, may be admitted after review and approval by the University Admissions and Standards Committee.

Students from approved institutions of higher education ordinarily will be given credit, hour for hour, for work done in these institutions insofar as it applies to the requirements of the curriculum pursued at Arizona State University. Arizona State University does not accept credit on transfer for courses in which lowest passing grades (D) were received. Grades and scholastic honor points earned at other colleges and universities, while part of the student's permanent record, are not included in the calculation of the student's cumulative index at Arizona State University.

Students who have registered in other colleges and universities may not disregard their records in such institutions in order to make application for admission solely on the basis of their high school records.

Failure to report previous college attendance at the time of registration is sufficient cause for cancellation of the student's enrollment, of any credits earned, or both.

Credits from Junior Colleges. Credits transferred from an accredited junior college may be accepted up to a maximum of 63 semester hours. Additional credit may be accepted only upon authorization of the standards committee of the college in which the student is enrolled at Arizona State Universtiy.

Junior college students planning to transfer to Arizona State University at the end of their first or second year should plan their junior college courses to meet the requirements of the curriculum selected. Loss of time often results from failure to do this. Junior college transfer students will be permitted to follow the degree requirements specified in the Arizona State University catalog in effect at the time they began their junior college work providing their college attendance has been continuous and normal progress has been made. Ordinarily, courses transferred from junior colleges will not be accepted as upper division credit at Arizona State University.

Credits from Tempe Religious Conference. Courses offered by the Tempe Religious Conference, Tempe, and approved for transfer are accepted for general elective credits by Arizona State University.

Credit for Military Service. For active service terminated under honorable conditions in the Army, Navy, Marine Corps, Air Force, or Coast Guard for a period of at least six months and less than a year, the University allows two units of military science; for one year or more of active service, four units of military science, and for a commission earned in the service, twelve upper-division units of military science.

Veterans must submit their records of service in the Armed Forces (photostatic copy of discharge and/or separation notice) to the Admissions Office as a part of their admissions credentials. Advanced standing credit will be granted on the basis of these records only if application is made at the time of admission to Arizona State University.

VETERANS' DEPENDENTS

Students who are eligible for benefits as children of deceased veterans must file in the Veterans Accounts Office in the Business Office their certificates of eligibility at the time of registration. The certificate of eligibility is required before the University can arrange with the Veterans Administration to have benefits made available to individual students. At the time certificates are filed students will receive instructions regarding application, payroll clearance and other important information connected with the program.

ADMISSION OF UNCLASSIFIED STUDENTS—UNDERGRADUATE

Persons 21 years of age or over who wish to enroll for six semester hours or less per semester of undergraduate course work may register as unclassified students. Unclassified students are not required to file transcripts or a residence classification form. These students must, however, file an unclassified student application for admission form. Unclassified students are not candidates for any degree. Students disqualified or otherwise not eligible for regular admission may not attend as unclassified students.

An unclassified student who wishes to work toward meeting requirements for a bachelor's degree must file an application for admission to a degree program with the Office of the Registrar and Director of Admissions and meet all admissions requirements in effect at the time he seeks admission as a degree-pursuing student. A maximum of 15 hours work completed as an unclassified student may be counted toward fulfilling degree requirements, provided the courses meet specific requirements within a degree program.

After a student has been admitted to a degree program he may not thereafter be permitted to register as an unclassified student.

ADMISSION OF FOREIGN STUDENTS

Foreign students seeking admission to Arizona State University in addition to meeting the requirements for regular admission either as a freshman or as a transfer with advanced standing credit must have the American Consul office in the vicinity of their home country forward to the Admissions Office at Arizona State University a certified statement that the student's English reading, speaking, and comprehension ability is such that the student can reasonably be expected to succeed in a university program here. Foreign students must also provide a personal data sheet in duplicate in addition to the application for admission. Foreign students are urged to be certain that their passport and visas are in order before coming to the United States.

Arizona State University has very limited scholarship resources for foreign students. In most instances, financial assistance will not be available. Before a foreign student leaves his home country he should have a certificate of admission from Arizona State University and a United States Department of Justice Immigration and Naturalization Service Form I-20 from Arizona State University. Arizona State University cannot provide on-campus employment to aliens because a state law provides that non-citizens cannot be on the Arizona State payroll.

All foreign students are required by Arizona State University to have insurance coverage against illness and accident before being permitted to register. The insurance must be maintained throughout the student's enrollment in the University. The cost of this insurance must be provided by the student. Comparable insurance with a reputable American insurance company is acceptable. Canadian students may be insured by recognized Canadian insurance agents.

RE-ADMISSION TO THE UNIVERSITY

Any former student, graduate or undergraduate, who has not been in continuous attendance at Arizona State University must obtain an application for re-admission from the records section of the Office of Registrar and Director of Admissions upon returning. This application should be submitted at least one month prior to the beginning of the semester in which the student plans to re-enter. Official transcripts of any additional work taken elsewhere must be sent from the Office of the Registrar at the institution where such credit was earned directly to the Office of the Registrar and Director of Admissions at Arizona State University.

Students whose cumulative grade point index is below that required for good standing will be denied re-admission. Students who have been denied re-admission may appeal to the University Admissions and Standards Committee.

ADMISSION TO SUMMER SESSION

Excepting those who plan to complete the degree requirements in summer sessions only, students will be admitted to the summer session without presentation of transcripts.

REGISTRATION

Registration Dates. Students should register on the registration dates announced in the University calendar. New students cannot complete the required aptitude and health examinations and finish registration in one day. Students registering late will be charged a late registration fee. Residence halls will be open to students on the dates scheduled in the University calendar.

Prerequisites to Registration. Before registering in the regular sessions, all students seeking admission must file transcripts of high school or college work, or both, and take the aptitude and health examinations required under the heading, "Admission to Arizona State University." In addition, students must meet special requirements given hereafter. All students, graduate or undergraduate, file applications for admission and transcripts in the Office of the Registrar and Director of Admissions. All students registering in a degree program, to gain admission to the Registration Hall, must present an "Approved Program of Studies" form signed by the student's adviser.

Classification of Students. Freshmen are those students who at the beginning of the academic year have less than 30 semester hours of credit; sophomores, those with 30 or more semester hours, but less than 60; juniors, those with 60 or more, but less than 90; seniors, those with 90 or more; graduate students, those holding a bachelor's degree from Arizona State University, or any other recognized institution.

Curriculum Advisers. Before entering the University, a student should study the curriculums outlined in order to determine the curriculum best suited to his interests and needs. Before registering, each student may select, tentatively at least, a curriculum. The designated curriculum adviser will counsel with the student regarding his proposed curriculum, his choice of courses, and approve both. He advises him as needed throughout his stay in the University.

Course Loads. Students carrying twelve or more semester hours of work are classified as full-time students for University classification purposes. *Male students to qualify as full-time college students for Selective Service classification purposes must be registered for and complete, each semester, one-eighth of the number of semester hours required for a degree. Thus, male students subject to the draft must be registered for, and complete sixteen semester hours each semester.* Students may not be registered at any other institution or in a Residence Center when in regular attendance here unless approval has been granted by the Standards Committee of the college in which the student is enrolled.

The maximum load for which a student may register is 18 semester hours, except for students enrolled in the Colleges of Architecture and Engineering Sciences. The maximum load for these students is 19 semester hours. Students who wish to register for more than these maximums must petition the standards committee of the college in which they are registered. Freshmen and lower division transfer students attending Arizona State University for the first time will not be permitted to carry an overload. Students having a low scholarship record may be required to carry a light load. Students carrying a full-time school job will be asked to carry a light load unless their previous records in scholarship and on aptitude tests are high. During the semester in which a student is registered for student teaching, the load should not exceed 16 semester hours.

Planning the Schedule. The schedule of classes covers both morning and afternoon hours, Monday, Tuesday, Wednesday, Thursday, and Friday, and morning hours only on Saturday. Full-time students are expected to devote both mornings and afternoons to their program of studies. They should not plan to take classes mornings only, or afternoons only, or less than five days per week.

Auditors. Persons wishing to audit courses will register in the regular manner and pay the regular fees. Audited courses carry no credit. Courses audited count toward the student's load. Students once registered for "audit" are not permitted to change to "credit" (and vice versa) after the close of the drop-add period.

Comprehensive Examinations. The purpose of the Comprehensive Examination is to permit the student an opportunity to establish credit in a course in which he has had adquate preparation or experience, but in which he has not received academic credit.

Policies and regulations governing the establishment of college credit by means of a Comprehensive Examination may be obtained from the office of the dean of the college in which the student is registered. Exceptions to these policies and regulations may be made only upon written recommendation of the student's adviser and approval of petition by the student to the standards committee of the college in which the course is offered.

The student who wishes information regarding policies and procedures should consult his adviser and make application through the office of the dean of the college in which he is registered.

Proficiency Examinations. A Proficiency Examination may be required for the waiver of a course requirement or for the validation of transfer credits in professional programs.

Information regarding policies and regulations governing the waiver of course requirements, or validation of transfer of credits in professional programs may be obtained from the office of the dean of the college in which the student is registered.

Late Registration. Students registering on or after the date specified for the beginning of classes each semester will be charged a late registration fee. Late registration for each semester is closed at 4:00 p.m. on Monday of the second week of classes. Students registered for 6 hours or less of evening classes only are not charged the late registration fee.

Incomplete Registration. Registration is not complete until all fees have been paid and all required examinations have been taken. Failure to satisfy any of the admission or registration requirements is sufficient cause for dropping a student from all classes.

Changes in Registration. Programs should be carefully planned under the guidance of the curriculum adviser so that changes in registration will not be necessary. After a student has completed his registration, changes may be made only through the Registrar's Office by means of a Drop-Add card. Changes may be made as late as Monday of the second week of the first semester. Changes may be made as late as Monday of the second week of the second semester.

Dropping Courses After the Close of Registration. The courses for which a student is registered at the close of the late registration period constitute his official registration and semester load. A student may officially drop a course or courses from his approved program of studies with a mark of W after the close of the Drop-Add period and before the end of the first six weeks of the semester. A student may withdraw after that date with a grade of E. Any exception due to injury, death in the family, or other crisis must be approved by the instructor, the Dean of the College in which the course is offered, and the student's curriculum adviser. Where exceptions are permitted, the recorded grade will be W or E in accordance with the student's status at that time. No student will be permitted to drop a course during the week in which final examinations begin.

A student who quits a course for which he is officially registered by absenting himself from class will receive a grade of E at the end of the semester.

To drop a course the student will obtain from the Office of Registrar and

Director of Admissions an Authorization for Dropping Course form and process it according to the instructions on the form.

Withdrawal from the University. Students who find it necessary to withdraw from the University should withdraw officially by obtaining and completing an official withdrawal card from the Office of the Registrar and Director of Admissions.

Until a student withdraws officially, he is registered in all courses and will at the end of the semester receive grades appropriate for his performance in each course. A student who officially withdraws from the University during the first six weeks of a semester receives the mark of W in all courses for which he is registered. Students who officially withdraw from the University later than the sixth week will receive a mark of W or E, depending upon the quality of the work at the time of the official withdrawal. No student will be permitted to withdraw during the week in which final examinations begin. Students who quit attending classes but who fail to officially withdraw will receive grades of E.

GRADING SYSTEM

Scholarship Grades. Scholarship grades on the student's report card and on his permanent record card are indicated by the letters and explanations given below.

A—Highest.
B—Above average.
C—Average.
D—Lowest passing.
Y—Credit.
E—Failure.

The following marks designate the situations concerning the student's academic program:

W—Withdrew (without penalty).
X—Audit.
I—Incomplete, given and removed as specified below.

The Mark of Incomplete. A mark of I, is given only when a student is unable to complete a course because of illness or other conditions beyond the control of the student. Negligence or indifference are never accepted as reasons for giving an I. It is the sole responsibility of each student receiving a mark of incomplete to contact the instructor or Dean of the College in cases where the instructor is no longer available, and complete the course within one calendar year. If an I is not thus removed it becomes a part of the student's permanent record.

Grade of E. Students receiving grades of E must repeat the course in the regular class if they desire credit. Both the E and the new grade remain as a part of the student's permanent record.

Mark of W. The mark of W is given in a course whenever a student (1) officially drops from a course during the first six weeks of the semester; (2) officially withdraws from the University during the first six weeks of the semester; (3) officially drops a course after the first six weeks only if passing at the time of withdrawal; (4) officially withdraws from the University after the first six weeks only if passing at the time of withdrawal.

Repetition of Course. Students may repeat any course. When a course is repeated the original grade remains on the student's record and is included in his cumulative scholarship index. A course, however, may only be counted once in meeting the hours required for majors, minors, or graduation.

A student may by formal petition to the Registrar, request that a grade of E received during his freshman or sophomore year, not be included in his cumulative index after he has repeated the course in residence with a passing grade prior to earning 63 semester hours of college work.

Change of Grade. A grade once reported to the Registrar's Office may be changed only upon the authorization of the faculty member issuing the original grade and the approval of the Dean of the College concerned.

A change of grade is made by filing an Authorization of Change of Grade Form with the Registrar's Office. The reason for the change of grade shall be entered on the form and signed by the faculty member and by the Dean of the appropriate college.

Grade Points. For the purpose of computing the scholarship index, grade points are assigned to each of the grades as follows: A, 4 points for each semester hour; B, 3 points; C, 2 points; D, 1 point; and E, 0 points.

Scholarship Index. The scholarship index is obtained by dividing the total number of grade points earned by the number of semester hours in the student's course load. Courses in which marks of W (withdrew), I (incomplete), Y (credit) and X (audit) are received are not included in determining the number of semester hours in the course load.

Reports to Students. Each student receives a Deficient Scholarship Report at the mid-semester for courses in which his grades are D or E.

Reports to Parents. The grade reports of all unmarried students under twenty-one showing their standing in each class are mailed to parents at the close of each semester. Report cards of other students are mailed to their home address unless the Office of the Registrar and Director of Admissions is notified at least six weeks prior to final examinations.

Reports to Arizona High Schools and/or Junior Colleges. A copy of the semester grade report of each student is sent to the Arizona high school and/or junior college from which he graduated.

RETENTION AND ACADEMIC STANDARDS

Dropping Course at Instructor's Request. A faculty member may drop a student from his class with a grade of E, whenever in his judgment, the student's (1) absence from class, except for illness or other reasons beyond his control, (2) continued presence in class is detrimental to the other members of the class, (3) lack of achievement or progress in the work of the course, constitutes justification for this action.

Probation and Disqualification. Students below the index requirement for good standing, shown below, may be placed on probation or be disqualified at the end of any semester, at the discretion of the college in which they are enrolled:

			Index
Freshman	0-29	Semester hours	1.60
Sophomore	30-59	Semester hours	1.75
Junior	60-89	Semester hours	2.00
Senior	90-126	Semester hours	2.00

The policy applies to all students not enrolled the spring semester, 1965.

Effective the autumn semester 1965-66, all lower division students (freshmen and sophomores) failing to achieve satisfactory performances (meet retention standards) may be placed on academic probation for the following semester with a course load not to exceed 12 semester hours, excluding Military Science.

Reinstatement. A student who has been disqualified may file an application for reinstatement with the dean of the college in which he was registered. After a review of his case by the dean of the college and upon recommendation by the standards committee of the college in which the student was registered, he may be reinstated on probation. A disqualified student has the right to be heard by the respective standards committee.

Scholarship Probation. Students who have been reinstated by action of the Standards Committee of the college in which they are enrolled or by the University Admissions and Standards Committee are on scholarship probation during the semester following reinstatement.

CONDUCT OF STUDENTS

Standards of Conduct. Under the policy of the University, students enjoy the greatest degree of liberty consistent with good work and orderly conduct.

Each student is expected to conduct himself in such a manner as to uphold, not detract from, the good name of the University and fellow students by conforming to the law and accepting the moral and social practices of the community, state, and nation.

These standards of conduct apply to all students, both on and off the campus, as long as they are enrolled in the University, and the University assumes that the act of registering as a student implies full acceptance of these standards of conduct. Failure to conform to these standards at any time may be considered sufficient cause for dismissal from the University. The authority of the University is exercised over all students individually and over all student groups or organizations bearing the name of the University, or representing or purporting to represent the University, in any student enterprises to the extent necessary to safeguard the good name and well-being of the University.

Among the circumstances which indicate possible dismissal from the University, if the student is found guilty, are whenever a student:

1. Endangers or seriously threatens the life or physical safety of others or self.
2. Leads or participates actively in destructive group action.
3. Has serious or repeated difficulties with law enforcement authorities.
4. Commits sexual immorality.
5. Does not respect public and private property.
6. Does not meet his just financial obligations in relations with others and/or the University.
7. Refuses to cooperate with efforts made to help him adjust to University responsibilities.
8. Conducts self in a manner though perhaps less serious than violations listed above, eventually would serve to discredit the University and/or its students.

Organizations bearing the name of the University and/or students singly or collectively purporting to act in the name of the University must receive official sanction from the President of the University before engaging in any proposed enterprises or making public announcements of same.

The possession, serving, or use of intoxicants of any kind whatsoever is prohibited on the campus, at all social functions held under the auspices of University-sponsored organizations or groups, wherever held, or at any other event in which University students participate where such possession, serving, or use may reflect on the good name and reputation of the University.

Appropriate dress is expected of students on the campus and in all campus buildings. In accordance with Associated Women Students' regulations, women students are expected to wear street clothes such as sweaters and skirts, dresses, or suits, unless they are going to or from a sports activity. For further details on dress in the Memorial Union and women's residence halls see "Co-ed Cues."

Attendance. Each student is expected to attend his scheduled periods of instruction and assume full responsibility for his absences.

FEES, DEPOSITS, AND EXPENSES

Changes in Fees. The Board of Regents reserves the right to change fees and charges when necessary without notice.

Extending Credit. The University cannot extend credit, therefore, students must have on hand when registering sufficient funds to pay for non-resident tuition, registration, incidental fees, and books. Room and board may be paid in installments, the first payment being due at the time of registration.

Definitions. Regular fees are those paid by all students. *Special fees* are those paid by certain students only, and under the conditions indicated.

Deposits are made to cover certain contingencies. All or part of the deposit may be returned depending upon the charges incurred by the student.

GENERAL SUMMARY

Summary of minimum annual expenses:

General University fees	$ 230.00	
Books and supplies	100.00	(approx.)
Total minimum cost to Arizona resident residing off campus	$ 330.00	
Room and Board	600.00[1]	(approx.)
Total minimum cost to Arizona resident residing on campus	$ 930.00	
Non-resident tuition	650.00	
Total minimum cost to out-of-state resident residing on campus	$1,580.00	

All students should add to this list incidental personal expenses as needed plus special fees and deposits.

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[1] Rates vary depending on the dormitory in which a student resides and on the basis elected for meals in the University cafeteria. Accommodations in dormitories at the $600 per year rate are limited. Above figures based on a five-day meal ticket.

REGULAR FEES

These fees are paid each semester by all students with the exception of those registering for Extension and Correspondence courses.

General University Fee $115.00
(Covers registration for more than six [6] semester hours)

This includes fees covering registration, student activities, student union, recreation, library, college series, stadium, alumni association and health service. (Please note Special Fees and Deposits are in addition to these fees.)

Registration Fee .... $12.00 per semester hour
(Registration for six [6] semester hours or less)

SPECIAL FEES

Special fees are paid by certain students under the conditions given below:

Admission Application Fee (Non-resident applicants) ....$ 10.00

All undergraduate applicants for admission, residing out of the state of Arizona, must pay a non-refundable admission application fee at the time application for admission is made.

Non-resident Tuition (per semester) $325.00

All students classified as non-residents, who register for twelve (12) or more semester hours, pay the full non-resident tuition, except graduate students who have been awarded graduate fellowships or teaching assistantships.

Students classified as non-residents who register for less than twelve (12) semester hours, but more than six (6) semester hours, are required to pay a non-resident tuition of $27.00 per semester hour. Those students registering for six (6) or less semester hours pay no tuition.

A student, to be considered a legal resident of Arizona for the purpose of registering at the Arizona State University, must present evidence as follows:

(1) **If under 21 years of age**—that the parent (or guardian) having legal custody has been a legal resident of the State of Arizona for at least one year next preceding the last day of registration for credit.

In the event that a legal resident of Arizona is appointed as the guardian of a non-resident minor, such minor does not become a resident until the expiration of one year from the time of appointment and then only upon a proper showing that such appointment was not made to avoid the non-resident fee.

(2) **If over 21 years of age**—that legal (*) residence in the state has been established for at least one year next preceding registration, and that he is eligible to become a registered voter. (Sec. 3 of Art. 7, Constitution of Arizona, provides, "**For the purpose of voting, no person shall be deemed to have gained or lost a residence . . . while a student at any institution of learning** . . . Sec. 6, Art. 7 provides, "No soldier, sailor or marine . . . shall be deemed a resident of this State in consequence of his being stationed at any military or naval place within this state.")

(3) **If an alien who has taken out first naturalization papers**—that residence has been maintained in the state for at least one year prior to registration, and that he has filed with the United States Immigration and Naturalization Service an application for such citizenship or a declaration of intention to make such application when eligible.

The student must have the question of his legal residence passed upon prior to registration and payment of fees. The responsibility of registration under proper residence is placed upon the student. If there is any possible question as to the legal residence, the student is responsible for obtaining a blank from the Registrar's Office, filling it out completely, taking it to a notary public in the Business Office, and making a sworn statement concerning the facts given, and returning the blank to the Registrar's Office. Any student found to have made a false or misleading statement as to his residence shall be subject to dismissal from the University.

In all cases where the records indicate that the student's home is outside of Arizona, non-resident tuition shall be assessed. Claims for refund may, however, be filed at any time within thirty (30) days.
Non-resident graduate students also pay the tuition.

(*) The attention of students who have not attained the age of 22 years and whose parents do not live in the State of Arizona is directed to the fact that presence in the State of Arizona for a period of more than one year immediately preceding the opening day of the semester during which it is proposed to attend the Arizona State University does not, of itself, entitle the student to classification as a resident.

Private Music Instruction

In addition to the usual University Registration Fees, the following fees are charged for private music instruction:

½-hour lesson per week—$27.00 per semester
1 hour lesson per week—$40.00 per semester

Music majors will pay a flat fee of $40.00 when registering for one or more hours of private instruction.

College of Nursing Examination Fee .... $ 8.00

To cover cost of the Graduate Nurse Examination(GNE)

Field Study and Field Trips

A special fee may be charged for field study or field trips to cover travel, meals, and lodging. Arrangements for the payment of such fees will be made in advance with the student.

Transcript Fee .... $ 1.00

(Requests for transcripts should be made to the Registrar and Director of Admissions one week in advance of the time desired.)

Senior Check-Out

Each senior is entitled to one official check-out, at the time application for graduation is filed, without charge, under the curriculum designated in his application for graduation. A fee of $1.00 will be charged for any additional checkouts.

Absentia Fee .... $ 7.50

Students who are granted permission to receive their degree in absentia pay this fee.

Auditor's Fees

Those taking courses for audit will register and pay the regular fees.

Graduate Entrance Examination Fees .... $3.50 to $10.00

Not required of all applicants. When applicable the prospective student will be notified by the office of the Dean of the Graduate College.

Master's Thesis Binding Fee .... $ 5.00

Education Specialist Report Binding Fee .... $ 10.00

Doctoral Dissertation Binding Fee .... $ 10.00

Doctoral Dissertation Registration Fee $115.00

A graduate student must be registered on a full-time basis for a minimum of two semesters for dissertation at full semester fee, and be registered in the semester in which the degree is granted, beginning with the fiscal year July 1, 1962.

Doctoral Dissertation Micro-Film Fee .... $ 30.00

Special Examination Fee .... $ 1.00

When, because of absence, or for any reason, it becomes necessary for a student to request a special examination in any course, a fee of $1.00 may be required for this special privilege.

Comprehensive Examination Fee .... $7.50 per semester hour

Paid by all students seeking to establish credit by examination.

Test Fees — Vocational .... $ .50

A nominal fee is charged to pay the cost of test materials only.

Graduation Fees .... $ 5.00

A graduation fee in the amount of $5.00 applies if paid on or before the dates specified in the section of the catalog headed **Graduation Requirements.** After that date, the fee is $10.00. If a student is granted permission to receive a degree in absentia, he shall pay an additional fee of $7.50.

Cap and Gown Rental Fee .... $4.00 to $9.25

Bachelor's cap and gown for baccalaureate and commencement exercises, $4.00. Master's cap, gown, and hood, $8.75. Education Specialist cap, gown, and hood, $9.25. Doctor's cap, gown, and hood, $9.25. These are approximate amounts and subject to change.

Fee for Dropping Course .... $ 1.00

Charged following last day of registration.

LATE FEES

Late Registration	$ 10.00

All students, excepting those registering for night classes only, who register on the date specified for the beginning of classes, or thereafter, pay this fee.

Late Aptitude Tests	$ 2.00

Paid by students taking the aptitude tests on the date specified for the beginning of classes or thereafter.

Late Physical Examination	$1.00 to $3.00

Charged beginning at noon of the last day scheduled for registration.

Late X-ray	Actual Cost

Charged all students who fail to take the X-ray on the date specified by the University.

DEPOSITS

Deposits are required of those students wishing certain privileges or services. The deposits are returnable less any charges which may have been incurred during the term of the services being rendered. See page 70 pertaining to forfeiture of refunds.

Science Breakage Deposits	$ 5.00

This deposit is required of all students taking the following science laboratory courses: CH 101, 102, 111, 113, 114, 115, 121, 225, 231, 300, 327, 331, 332, 341, 421g, 431g, 435g, 443g, 444g, 446g, 448g, 452g, 465g, 466g, 525, 526, 527, 531. If breakage exceeds the initial $5.00 an additional deposit will be required.

Women's Gymnasium Deposit	$ 5.00

This deposit will be required of all freshman women physical education students.

Military Uniform Deposit	$ 25.00
Student Housing Application Deposit	$ 25.00

Reservations for rooms are obtained by filing an application and $25.00 deposit with the Housing Office. See page 70 pertaining to forfeiture of refunds.

GENERAL EXPENSES

ROOM AND BOARD PAYMENTS

Payment for residence halls may be made in advance for the entire semester, or on an installment schedule as outlined below:

(a) One half of semester charge due on the day of registration for classes.
(b) One fourth due on Monday of the fifth week of classes.
(c) Final payment due on Monday of the tenth week of classes.

The Director of Housing may approve special payment schedules for students on evidence of financial hardship. Students must, however, initiate petition for exception to the standard payment schedule, prior to the normal due dates for payment.

The Memorial Union Dining Hall offers meals on a 5-day or 7-day meal ticket basis with as many additional portions as the student desires served at no extra cost. Individual meals are also available on a la carte basis at regular prices. The meal ticket costs per semester are $170.52 for a 5-day or $233.45 for a 7-day meal ticket. This breaks down to a daily cost of $2.00 for three meals.

Rooms are available in college residence halls at rates listed below:

MEN'S RESIDENCE HALLS	Semester Rate	School Year
Irish	$140.00	$280.00
Hayden & M. O. Best	160.00	320.00
Sahuaro (includes 5-day meal ticket)	340.00	680.00
Adelphi (includes 5-day meal ticket)	350.00	700.00

WOMEN'S RESIDENCE HALLS	Semester Rate	School Year
Quad Halls & Gammage	$140.00	$280.00
Wilson	160.00	320.00
McClintock A & B	170.00	340.00
Palo Verde, Palo Verde East and Palo Verde West (includes 7-day meal ticket)	400.00	800.00

PAYMENT AND REFUND OF FEES:

REFUNDS OF RENT AND BOARD

Refunds to students departing from residence halls prior to the end of the semester are computed on the following basis:

(a) **Rent:** Students forfeit their room deposit and will be charged 10% of the total semester rate for each week or partial week of registered occupancy, beginning with Sunday prior to the first week of classes. Total rent charges shall not exceed the semester rate, except when added charges are assessed for losses and/or damages to institutional property.

(b) **Board:** Except when official check-out occurs during the last two weeks of the semester, departing students shall be charged for meals through the end of the week in which formal check-out occurs. Students departing during the last two weeks of the semester shall be charged the full semester rate for meals. No refunds are made for meals missed at any time prior to the end of charge periods as indicated above.

PAYMENT OF FEES

The payment of fees cannot be deferred. By regulations of the Board of Regents based on a ruling of the Attorney General, registration and other University fees are payable on the day of registration.

Method of Payment

Payments to the University should be made by currency, traveler's check, bank money order, cashier's check, or certified check. Personal or company checks requiring change will not be accepted during registration and during a period of one week preceding and two weeks immediately following registration. Personal or company checks in the exact amount of charges being collected by an individual cashier will be accepted. (Separate cashiers are used on registration, bookstore, board, and room charges.)

REFUNDS

Activities and Other Fees Including Laboratory

Students withdrawing from school or dropping classes will receive a refund based on a percentage of the total semester fees paid, in accordance with the following schedule:

1 thru 14 days	80%
15 thru 21 days	60%
22 thru 28 days	40%
29 thru 35 days	20%
After 35th day	None

The days referred to are calendar days, beginning with the first day college classes begin. Percent of refund will be determined by date refund is applied for in the Business Office.

Exception: (1) In case an applied music course is dropped, because of actual illness, or other emergency beyond the control of the student, not more than half of the semester fee paid may be refunded. (2) The above refunds do not apply to Summer Session.

Forfeiture of Refunds

All refunds and deposits due students for any reason whatsoever will be forfeited unless called for on or before June 30 of the college year in which they are due. Should June 30 fall on Sunday or on a day when the Business Office is closed, the refund will be made on the next business day.

RESERVE OFFICERS TRAINING CORPS (ROTC)

Arizona State University offers basic and advanced courses in Military and Air Science. The basic courses are designed to provide training in basic leadership techniques, to develop an understanding of the roles of the Air Force and the Army in the defense of the United States and to prepare the student for the advanced courses. The advanced courses, which are offered only to selected students on a contractual basis, provide training which qualifies the student to perform the duties of commissioned officers in the Army and Air Force. Upon graduation, each student who satisfactorily completes the advanced course will receive a commission in the Air Force or Army Reserve. Appointments as second lieutenant in the Regular Air Force and Regular Army are available to outstanding students who desire a career in the military service.

Prerequisite to Graduation. As a prerequisite to graduation, all male freshmen and sophomore students registered for more than six semester hours, must complete four semesters of basic military or air science (in successive semesters), unless properly exempted. A student who disenrolls, and who later returns to the university must continue to meet this requirement. This prerequisite is modified for undergraduate transfer students on the basis of transfer credit accepted at the university.

Exemptions and Modification of Requirement. (a) Alien students—exempt. They may be authorized to pursue the course, however. (b) Students certified as physically unfit by the university physician—exempt. (c) Students who present evidence of at least one year of active military service —exempt. (d) Students whose age is such that they would not be able to complete the advanced course and requirements for degree prior to reaching their 28th birthday (normally 23 years of age or older)—exempt. (e) Students who are active members in good standing of a Reserve or National Guard Unit—exempt. (f) Students transferring sufficient accepted credit in military training from an accredited institution—exempt. (g) Students transferring sufficient accepted credits for junior or senior standing—exempt. (h) Students transferring credits accepted at Arizona State University may reduce the four semester basic ROTC requirement as follows: those transferring with 1-12 hours must complete four semesters; those with 13-24 hours must complete three semesters; those with 25-40 hours must complete two semesters; and those with 41-55 hours must complete one semester. (i) Students who offer other reasons acceptable to the Admissions and Standards Committee—exempt. Students requesting exemptions will present the evidence on which they claim exemption to the Registrar at the time of registration.

Waivers. On the basis of previous honorable active service in the Air Force, Army, Navy, Marine Corps, or Coast Guard, a student may request from the chairman of the department a waiver of the basic course, or any portion thereof, as a requirement for entrance into the advanced course. Veterans entering at freshman or sophomore level who desire a commission through ROTC will be required to take, in phase with non-veteran contemporaries, the portion of the basic program which remains after waiver.

Attendance and Credits. Basic course students receive 1.5 semester hours of credit for two hours of class and one hour of drill per week or 0.5 semester hours of credit for one hour of drill per week. Advanced students spend four hours in class and one hour in drill each week, and receive three semester hours of credit. Advanced students are required to attend a summer encampment, normally at the end of the first year of the advanced course. Participation in ROTC military training does not excuse students from any of the physical education requirements.

Pay and Allowances. Advanced students receive pay for subsistence at the rate of $.90 per day while attending the two-year course, for a maximum of 637 days, less the days while in attendance at a Summer Training Unit.

In lieu of subsistence, the student will receive pay at the rate of $78.00 per month during attendance at the summer encampment. Uniforms, housing and dining facilities are provided at camp without cost to the student.

Draft Deferments. Draft deferments are available for certain freshmen and sophomores enrolled in the basic course. Those juniors and seniors who qualify and are enrolled in the advanced course are granted deferment from induction by local Selective Service Boards.

Deposit. All students registering for ROTC will make a deposit of $25.00 with the Military Property Custodian as the basis for issue of the prescribed uniform, text books, other authorized materials, and to cover certain authorized social activities. This deposit, less deductions to defray the above costs, or loss or damage of uniforms or text books through personal neglect, may be refunded at the end of each semester by the Military Property Custodian.

AIR SCIENCE

Advanced Course cadets who qualify for pilot training will receive approximately 36 hours flight instruction during their second year of advanced training. Normally, the student can obtain a private pilot's license at the same time. The AFROTC Summer Encampment consists of four weeks military instruction at an Air Force Base located nearest the cadet's declared home of record.

MILITARY SCIENCE

The four-year course of study in Army ROTC qualifies graduates for appointment as Reserve or Regular officers in any of the following arms and services, subject only to vacancies available: Adjutant General's Corps, Armor, Army Intelligence, Artillery, Chemical Corps, Corps of Engineers, Finance Corps, Infantry, Medical Service Corps, Military Police Corps, Ordnance Corps, Quartermaster Corps, Signal Corps, Transportation Corps. Army aircraft pilot training (both helicopter and fixed wing) is available to graduates requesting such training who meet the physical requirements. Active duty tours for graduates commissioned in the U.S. Army Reserve are normally for two years, followed by a period of reserve service. Graduates who request a delay in their call to active duty for the purpose of pursuing a graduate degree are usually granted such delay provided they continue in the graduate school on a full-time basis.

High School ROTC. Students having successfully completed three years of high school ROTC may be given constructive credit for the first year of the Army ROTC Basic Course. Such students may be enrolled in MS II during their first year at this institution.

Transfer Students. Students entering this University as transfer students with sophomore, junior, or senior status who indicate a desire to enter the Army ROTC Advanced Course may be permitted by the PMS to do so at the beginning of their second year at ASU. Such students will then take the MS II and MS III courses concurrently, thereby completing the program in three rather than four years.

GENERAL EDUCATION

Requirements. Completion of a pattern of general education courses is required of all students who are candidates for a bachelor's degree in any curriculum. The specific patterns and sequences of general education requirements will be established by the colleges of the University within the overall required total number of hours, and the general program of courses approved by the General Education Council. The general program of courses is given below. Since requirements under this program vary somewhat from one curriculum to another, the student should select from indicated courses only after consultation with his adviser. Students from approved institutions of higher education ordinarily will be given credit, hour for hour, for work done in those institutions insofar as it is equivalent in content to courses in this program.

Objectives. The purposes of general education at Arizona State University are expressed in the following objectives, adopted by the faculty in 1954.

1. To develop the individual's awareness of, and esteem for, the privileges and responsibilities of citizenship in a democratic society, and to motivate effective participation in endeavors for the common good.
2. To so improve the individual's ability to think, that he will reach valid conclusions and build a system of critically examined values by which to guide his life.
3. To so improve the individual's ability in the basic arts of communication that he will express himself effectively, and read and listen with understanding and discernment.
4. To introduce the individual to the major problems of philosophy, and to develop a discriminating appreciation of art, music, and literature, and encourage a satisfying avocational interest in these fields.
5. To develop sufficient understanding of the biological and physical sciences, and of mathematics, so that the individual will comprehend the roles they play in our civilization and appreciate the scientific approach to many problems of human experience.
6. To develop the individual's understanding of human society, and of his cultural heritage, and to motivate application of this understanding to the social issues of the time.
7. To help the individual achieve sufficient understanding of himself, to maintain physical and mental health, and to develop his abilities for his own and the common good.

Program. Courses which are accepted as meeting general education requirements are indicated in the program below. A total of 40 semester hours is required for graduation in any curriculum, with minimums in each field as specified below. Where a course requirement is met by advanced standing credit or is waived by virtue of satisfactory performance on a proficiency examination, these stated semester hour requirements are correspondingly reduced. Juniors and seniors should not take a freshman course in general education except where there is no alternative.

I. Communications.

For all curriculums leading to a bachelor's degree, a minimum of 6 semester hours.

EN 101, 102 First Year English-3,3, is required of all students. The requirement of EN 101 or 102 may be waived upon demonstration by examination of such exceptional proficiency as the English Department may require. Students who pass an exemption examination in EN 101 will register for EN 104 Advanced First Year English-3, instead of EN 102.

The following courses may be used as general education electives: SE 100 Elements of Speech-2, SE 300 Principles and Methods of Discussion-3; EN 211 Advanced Composition-3, EN 212 English Prose Style-3; GB 233 Business Communication-3; ES 400 Technical Communications-3; PI 103 Elementary Logic-3; or one year of a foreign language at the elementary or intermediate level.

II. Humanities.

For all curriculums leading to a bachelor's degree, a minimum of 8 semester hours.

Option I

Eight semester hours from the following courses, with at least three of the subject fields represented. This option is intended for students who wish to distribute humanities through four years.

First year courses: AC 100 Introduction to Architecture-2; AH 102 Introduction to Art-3; EN 103 Introduction to Literature-3; FL 100 Introduction to Foreign Languages-2; MU 107 Introduction to Music-2; PI 101 Introduction to Philosophy-3.

Second year courses: AH 211 Western Art to the Renaissance-3, AH 212 Renaissance Art-3; EN 201 World Literature—The Classical and Medieval Periods-3, EN 202 World Literature—The Renaissance and Modern Periods-3, EN 204 Literature of Today-3; PE 280 History and Philosophy of Dance-2.

Third and fourth years: AC 301 American Architecture-3, AC 311, 312 Historical Architecture-3,3, AC 317 Oriental Architecture-3, AC 413, 414 Modern Architecture-3,3; AH 313 Contemporary Art-3, AH 321 American Art-3, AH 417 Oriental Art-3; EN 321 Introduction to Shakespeare-3, EN 341, 342 American Literature-3, 3, EN 355 History of the Drama-3; FR 321, 322 French Literature-3,3; GR 321, 322 German Literature-3,3; RU 321 322 Russian Literature-3,3; SP 321, 322 Spanish Literature-3,3; MU 355 American Music-2, MU 356 The Musical Theater-2; PI 322 Ancient and Medieval Philosophy-3, PI 323 Modern Philosophy-3, PI 328 Recent Idealist and Existentialist Philosophies-3.

Option II

HU 101, 102 Ideas and Values in the Humanities-4,4

or

HU 301, 302 The Humanities in the Western World-4,4.

III. Behavioral and Social Sciences.

For all curriculums leading to a bachelor's degree, a minimum of eight semester hours, with at least two subject fields represented.

First and second years: AN 111 Elementary Anthropology-3; EC 102 The Development of the American Economic System-3, EC 201, 202 Principles of Economics-3,3; EF 111 Exploration of Education-3; GB 101 Introduction to Business-3; HI 101, 102 Survey of Western Civilization-3,3, HI 103, 104 History of the United States-3,3; ME 201 Technology and Social Change-2; PS 100 Government and Politics-4, PS 200 Problems of American Government-4, PS 250 Comparative Government-4, PS 260 International Relations-4; PY 100 Elementary Psychology-3, PY 112 General Psychology-4; SO 101 Introductory Sociology-3.

Third and fourth years: HI 301, 302 Ancient Near East and the Classical World-3,3, HI 303, 304 American Cultural History-3,3, HI 305, 306 Eastern Civilization-3,3, HI 325 Diplomatic History of Modern Europe-3; ME 300 Man and Machine-2, ME 301, 302 Science and Technology in History-3,3; PS 310 Federal Constitution and Government-2, PS 311 Arizona Constitution and Government-1, PS 312 National and Arizona Governments-3, PS 440 Western Political Thought-3, PS 441 Recent Political Thought-3, PS 442 American Political Thought-3, PS 460 World Politics-3; AN 311 Principles of Social Anthropology-3, AN 331 Prehistory-3; SO 301 Principles of Sociology-3, SO 341 Modern Social Problems-3, SO 355 Courtship and Marriage-3; HO 331 Family Relationships-3; AE 300 The Agrarian Heritage-3.

IV. Sciences and Mathematics.

For all curriculums leading to a bachelor's degree, a minimum of eight semester hours, with at least two groups represented.

Group 1. Physical Sciences.

CH 101, 102 Introduction to Chemistry-4,4, CH 111 College Chemistry-5 or CH 113, 114 General Chemistry-4,4 or CH 115 General Chemistry with Qualitative Analysis-5; GE 111 Elements of Geography-4, GE 112 World Geography-4, GE 411 Principles of Physical Geography-3; GL 111 General Geology-4, GL 113 Physical Geology-4, GL 114 Historical Geology-4, GL 483 Earth Science-3; PH 110 Physical Universe-4, PL 121 Descriptive Astronomy-2, PL 321 General Astronomy-3, PL 361, 362 Science and Man-2,2, PL 410 History of Physical Sciences-3; PH 101 Introduction to Physics-4, PH 111, 112 General Physics-4,4, PH 115, 116 General Physics-5,5, PH 251 Sound and Optics-2, PH 320 Musical Acoustics-4, PH 361 Modern Physics-3.

Group 2. Life Sciences.

BI 100 The Living World-4; BO 100 General Botany-4; MI 102 Elements of Microbiology-4; ZO 100 General Zoology-4, ZO 300 Biogenetics of Man-4.

Group 3. Mathematics.

MA 116 Intermediate Algebra-3, MA 117 College Algebra-3, MA 118 Trigonometry-3, MA 120, 121 Analytic Geometry and Calculus-4,4, MA Mathematical Analysis-4, MA 205 Mathematics for General Education-4, MA 212 Analytic Geometry and Calculus-4, MA 241 Mathematical Analysis-3, MA 342 Vector Spaces-3, MA 485 History of Mathematics-3; ST 226 Modern Statistics-3.

V. Physical Education and Health.

All students who are under 25 years of age at the date of entrance and who are classified as freshmen are required to register for freshman physical education activity and to continue registration therein until one semester hour of credit has been earned, unless the requirement is waived.

The following courses may be used as general education electives: HE 100 Healthful Living-3; PY 270 Mental Health-3; HE 360 School-Community Health-3; and any physical education activity courses up to two semester hours.

VI. General Education Electives.

To complete the total requirements of 40 semester hours, the student shall select from the courses listed in any of the areas above, except that the courses selected may not be in his major field or field of specialization. These courses should be chosen with the approval of the adviser, to correct evident inadequacies in the general education background of the student.

HONORS PROGRAM

PURPOSE

The Honors Program is designed for students of exceptional ability who are interested in scholarly attainment. Through this program, it is hoped to encourage the student to develop an awareness of the interrelatedness of all knowledge and experience, and to make him more concerned with basic values—intellectual, aesthetic, social and ethical. Wide reading, thorough scholarship, and independent creative work are emphasized throughout the program.

ADMISSION

Students may be admitted to the Honors Program on the basis of their previous academic record, specialized tests and a conference with an examining committee of the Honors Council of the College in which the student is enrolled.

DESCRIPTION

Students admitted to the Honors Program will spend a considerable portion of their time in the serious study of the general field of their major and will also do some work in related fields and in General Education. The work includes: (1) general reading and discussion covering the entire major field, with emphasis on those areas not covered by formal courses, plus such work in related fields as may seem desirable; (2) specialized and intensive work in some phase of the major field selected by the student in consultation with his Honors adviser and approved by the department of his major. The student's thesis, or creative project, will be within this field of specialized work.

The program has the same general requirements for graduation as exist within the regular degree programs. In order to stimulate the student to do outstanding work, the adviser, operating under the rules established by the Honors Council in each College, may substitute work on a higher level than that stipulated in the General Education or major requirements but always within the same field.

GRADUATION REQUIREMENTS

For graduation with honors, the student must pass a comprehensive examination in his major area. In addition he must present to the Honors Council an acceptable honors project consisting of a thesis or an equivalent creative project. The student may be required to defend the thesis or creative project before an examining committee of the Honors Council. A cumulative grade index of 3.25 is required for graduation with honors.

Students successfully completing the program will be graduated *magna cum laude* or *summa cum laude* in recognition of their scholarly achievements.

For specific details of individual College Honors Programs, see the individual College sections of the catalog.

BACCALAUREATE DEGREE REQUIREMENTS

The University grants the following baccalaureate degrees: Bachelor of Arts, Bachelor of Science, Bachelor of Architecture, Bachelor of Science in Engineering, Bachelor of Science in Nursing, Bachelor of Arts in Education, Bachelor of Music, Bachelor of Fine Arts. To obtain a second bachelor's degree, the student must do an additional 30 hours of work or more and meet all of the requirements of the particular degree.

The Unit of Credit. The semester-hour is the unit of credit. It represents one fifty-minute class exercise per week per semester with two hours of outside preparation.

Credit Requirements. A minimum total of 126 semester hours is required for graduation with a bachelor's degree. Forty per cent of the semester hours required for graduation must be in upper division courses numbered 300 or 400.

Credit earned in correspondence courses may be applied toward the bachelor's degree; however, not more than 30 semester hours of credit in correspondence courses and/or by comprehensive examination will be accepted for credit toward the degree. (See section on "Extension Division.")

Meeting New Course Requirements. Students whose registration and attendance is continuous may graduate under the curriculum and course requirements or equivalent, and regulations for graduation, as stated in the catalog for the year the student first registered.

Effective for students enrolling for the first time after September 1, 1965, continuous residence shall be construed to apply or be in effect, provided the student receives credit for at least three semester hours for each semester, for a total of up to eight semesters. If the continuous enrollment extends beyond eight semesters, the credit received for each must not be fewer than three for each semester and must average six semester hours of credit received for the next eight semesters. Continuous residence will not apply for any degree program beyond 16 semesters and the student will then be required to meet the graduation requirements of the catalog in effect at the time of graduation. Summer school enrollment does not affect continuous residence interpretations.

When registration and attendance is not continuous, the student will be required to meet the curriculum and course requirements and regulations for graduation, as stated in the catalog for the year the student registers for final continuous residence prior to graduation.

Military and Air Sciences. All male students entering the University as freshmen or sophomores, unless properly exempt, are required to complete two years of basic military or air science. Male students who elect advanced military or air science, unless properly exempt, shall complete that course as a prerequisite for graduation.

Physical Education. All students who are under 25 years of age at the date of entrance and who are classified as freshmen are required to register for PE 101-102, and to continue registration therein until they have completed one semester hour of credit in physical education. Exemption from this requirement may be made only because of physical disability or health factors by the University physician. Students enrolled for six semester hours or less need not register for physical education during their first two semesters of residence, but must complete one semester hour for credit prior to graduation.

Scholarship Requirements. In order that a student may be eligible for graduation, his cumulative scholarship index must be 2.00 or better for all work taken while a student at this University.

Graduation With Distinction. Students who have a cumulative scholarship index of 3.00 through 3.49 will be graduated "With Distinction." Students who have a cumulative scholarship index of 3.50 through 4.00 will be graduated "With High Distinction." Students to qualify for graduation with these designations must have completed at least 60 semester hours in residence at Arizona State University and all transfer credits must be at least of equal academic quality.

Graduation With Honors. Students in the Honors Program who have a cumulative scholarship index between 3.25 and 3.49 and are approved for scholarly achievement by the Honors Council will graduate "magna cum laude." Those in the index range of 3.50 to 4.00, on approval of the Honors Council, will graduate "summa cum laude."

Residence Requirements. A minimum of one year residence as a regular student is required of every candidate for the bachelor's degree, and the final 12 semester hours immediately preceding graduation must be taken in residence. For purpose of record, a year in residence is defined as 30 semester hours of credit earned either in on-campus courses or in established residence centers of Arizona State University. It has no reference to living in residence halls or in Tempe.

Credit earned in correspondence courses cannot be used to meet residence requirements. The 12 semester hours of final residence may be taken during a semester of the regular academic year or during the summer terms. Exception to the final 12-semester hour regulation may be made by the University Admissions and Standards Committee. Petitions for an exception must be made in writing and addressed to the Registrar and Director of Admissions.

Application for Graduation and Teaching Certificates. Students who plan to complete requirements for graduation at the end of either summer term or the first semester should pay the Application for Graduation fee and file their application for graduation with the Registrar and Director of Admissions before registering for their final term or semester. Those planning to complete degree requirements during the first semester must file an Application for Graduation prior to April first of the preceding academic year. Those planning to complete requirements for graduation in May should pay the Application for Graduation fee and file their applications for graduation with the Registrar and Director of Admissions before November 15. A $5.00 late fee is charged students planning to graduate in May who do not file the application for graduation by the November 15th deadline. The filing of late applications for May commencement extends from November 16 to the last day of late registration for second semester. Students cannot change their application from one degree to another after the beginning of the final semester's work.

Application blanks are obtained in the Office of the Registrar and Director of Admissions. Candidates who fail to pay the Application for Graduation fee and file applications at the times specified are required to pay the late fee, and may be scheduled for graduation at a later date. Upon filing an application for graduation, a final check on graduation requirements is made by the Office of the Registrar and Director of Admissions. A check sheet showing the remaining requirements for graduation under the curriculum designated in the application is furnished the student as a guide to his final semester's registration.

Applications for teaching certificates should be obtained at the Office of the Registrar and Director of Admissions at the time of filing Applications for Graduation. Applications should be filed promptly after taking the oath of allegiance.

Attendance at Commencement Exercises. Candidates for degrees are required to be present at the commencement exercises in the prescribed academic costume. Exceptions to this rule will be made only in extreme cases, and upon petition to the Registrar. The $7.50 absentia fee is to be submitted at the time the petition is filed. If the petition is not accepted, the fee will then be refunded.

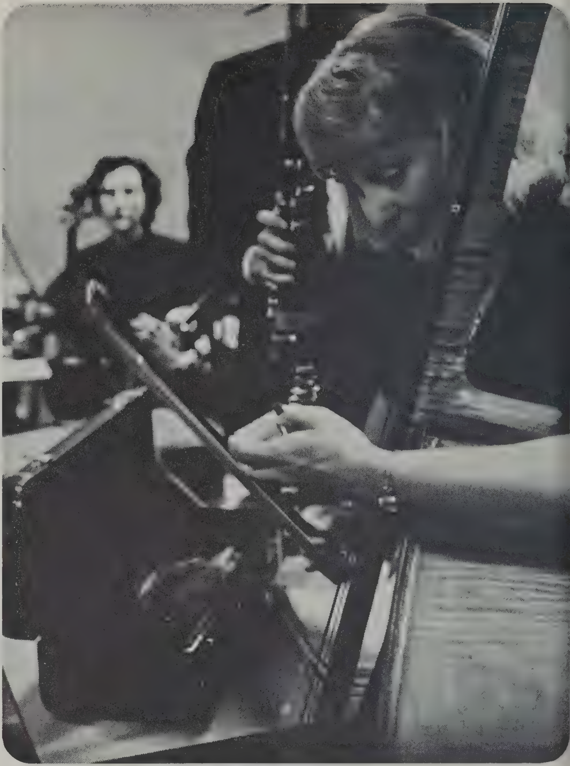
Financial Clearance. Before a student may participate in the commencement exercises or receive his diploma, he must obtain financial clearance at the Business Office. Financial clearance indicates that the regular fees, library, dining hall, and all other fees have been paid.

ADVANCED DEGREES

The University grants the following advanced degrees: Master of Arts, Master of Science, Master of Arts in Education, Master of Science in Engineering, Master of Fine Arts, Master of Public Administration, Master of Natural Sciences, Master of Business Administration, Master of Music, Master of Social Work, Education Specialist, Doctor of Education, and Doctor of Philosophy.

See section of the catalog headed "The Graduate College" for statements of requirements for these degrees.

Addition to M. O. Best Residence Hall.



STUDENT SERVICES, ORGANIZATIONS AND ACTIVITIES

UNIVERSITY GUIDANCE PROGRAM

Arizona State University offers an advisement and counseling program for students designed to assist the student to develop an educational program relevant to his individual needs and aspirations. Elements of the program include orientation, counseling and testing, curriculum advisement, and several counseling diagnostic services.

Orientation. An orientation program is provided for new students. It includes placement testing, health examinations, social events and review of university curriculums and services.

Counseling and Guidance Program. Often, a student needs assistance in making the adjustment to University life which is prerequisite to academic success. Personal counseling is available to individual students from the Dean of Students and his staff for men, and from the the Associate Dean of Students and her staff for women. In addition to individual counseling, the personnel deans have responsibility for guidance and direction of the out-of-class programs of organizations, honor societies, activities, residence hall living and student government.

The University Testing Service, located in the Hiram Bradford Farmer Education Building, administers and scores group tests for orientation and guidance purposes, provides a research service for the University, and scores examinations administered by the academic departments. Tests are also administered to individuals by the Research and Testing Service, the Counseling Center, Reading Clinic, and the Psychological Clinic in connection with individual counseling.

Curriculum Planning. Every student needs a plan of study by which he pursues his main objectives in collegiate education. This plan of study is his curriculum. Entering students frequently need advice and assistance in deciding upon their curriculums. Arizona State University attempts to meet this need by providing opportunities for each student to consult with an academic adviser, select an academic area which seems to meet the professional interests and abilities of the student (this is then called the student's major field), and make out a study plan (the student's curriculum). The student may keep this curriculum and major field, and may continue to discuss his academic plans with the same adviser throughout his college career; or he may change to another major field and adviser in the future.

The Psychological Clinic. The Psychological Clinic functions under the Department of Psychology as a training center for advanced students in diagnostic testing and psychotherapy. A nominal fee for services will be charged.

Speech and Hearing Clinic. The Speech and Hearing Clinic provides the opportunity for students to gain practical experience working with children and adults handicapped by speech or hearing disorders, and in giving examinations and therapy for those who need help. The service is made as available as possible to University students, the public schools, educational and medical agencies, and individuals in the community.

The Counseling Center. The Counseling Center has two main functions: (a) to provide counseling services for University students who request vocational, educational and personal counseling; (b) to provide supervised laboratory experiences for students in Counselor Education.

Honors Advisers. In the departments of each of the colleges offering the Honors Program are honors advisers.

HOUSING

Residence Halls for Women. There are eight halls ordinarily occupied by women students. These are Gammage Hall, McClintock "A" Hall, McClintock "B" Hall, Palo Verde Hall, Palo Verde East Hall, Palo Verde West Hall, Quadrangle, and Wilson Hall. Palo Verde West is a freshman hall, McClintock "A" Hall is for upperclass women and McClintock "B" Hall is an honor hall with special requirements for residency. The rest are general halls.

Residence Halls for Men. There are six halls ordinarily occupied by men students: Hayden, Irish, M. O. Best "A", "B", and "C", and Sahuaro Halls.

Reservations. Application materials obtained from the Housing Office will include forms to be completed by prospective students desiring living quarters in University Residence Halls. The housing application includes a Housing Agreement form and Room Reservation card. In signing the Housing Agreement, applicants pledge to accept living quarters in University Residence Halls for an *entire semester,* together with the financial responsibilities for said period of occupancy.

Housing applicants must forward the completed Room Reservation card and Housing Agreement form together with a $25.00 room deposit, to the Housing Office. Room reservations will not be confirmed until the applicant has been cleared for admission to the University by the Admissions Office.

Preferences of residence halls may be stated at the time of making reservations. Assignments to halls are made by the Housing Office in line with policies established by the University. Assignments to the honor hall for women are made through the office of the Associate Dean of Students. Room assignments are made by the Head Residents under the supervision of the Dean of Men in the men's halls and the Assistant to the Associate Dean of Students in the women's halls.

Residence in halls, sorority or fraternity houses is restricted to students registered for 12 or more units of regular work. Any exception must be approved by the Associate Dean's office for women and Dean of Students' office for men. The University reserves the right to change the residence of any student or to deny or cancel residence accommodations of any students in cases where such action is deemed desirable.

Occupancy. Housing accommodations are available for occupancy one day preceding Freshman Week. Students are expected to vacate accommodations by noon Saturday of the last week of school.

Residence halls are closed during the Christmas vacation period. One residence hall for men, and a second hall for women may remain open during the holidays if student demand is sufficient to justify vacation accommodations. Students remaining on campus shall be charged a vacation housing fee.

Hall Facilities. All student rooms are provided with steam heat, and are furnished with a study table, a dressing table or chest, and chairs. Types of sleeping accommodations differ in the various residence units. There is a laundry room in each residence hall, furnished with ironing boards.

Personal Equipment. The following list of equipment is the minimum which students should bring with them when entering a hall: blankets and comforts for a single bed, one bedspread, dresser scarf, bathrobe, soft-soled slippers, shower slippers, alarm clock, towels and wash cloths, and washable laundry bag. Students assigned to a number of older, more moderately-priced halls may find it advantageous to provide their own study lamps. The University does not provide study lamps except as built-in or stationary fixtures in the newer halls. All personal property should be clearly marked with the name of the student. *The University provides and launders sheets and pillow slips.* Personal property is not covered by college insurance.

Care of Halls. The University attempts to furnish comfortable and attractive living conditions for students. Students are expected to cooperate by keeping them so. Should any damage, beyond the usual wear, occur to the decorations and furniture of a room, the cost of redecoration or repair will be charged to the occupants of the room.

Residence Regulations. No single university influence may contribute more to the development of the personality and character of a student than that of residence hall life. The halls are so equipped and managed as to secure the maximum values at a minimum cost. No cooking of any kind is permitted in students' rooms. Electrical appliances such as irons, TV sets, percolators, grills are to be used only in lounges, kitchens, and utility rooms. *Vocal or instrumental music may not be practiced in any of the halls.* Arrangements for such practice may be made through the Music Department. If radios are used, they must be adjusted so as not to interfere with the rights of others. No pets are permitted in the halls. Nominal dues are collected in each hall by the respective Hall Councils. This fee may not be refunded.

Regulations Concerning Guests. Guests may be accommodated in residence halls when space is available under the following conditions: (a) that the permission of the head resident has been secured; (b) that guests do not accept invitations from residents for the first four nights of the week or during examination time unless absolutely necessary; (c) that guests do not ask for accommodations for more than a three-day period. Visiting student groups may be accommodated if space is available, when previous arrangements are made in the Housing Office. A nominal rental fee is charged for these accommodations.

Residence Regulations for Women Students. Young women may be absent from the halls overnight only with the written consent of their parents, which must be on file with the Associate Dean of Students and the head resident at the time of departure. On these occasions residents sign out, indicating where they may be reached in case of emergency. Other regulations for women students appear in Associated Women Students' Handbook, "Co-ed Cues."

Housing Regulations for Undergraduate Women Students Under 23 *Years of Age.* Undergraduate women students under 23 years of age are required to live in the University residence halls and are expected to carry an academic load of at least 12 semester hours. Exceptions are made for those women who live with their parents, guardians, or close relatives, or who work in a private home for their room and board.

In the event that all women's residence halls are filled, upper class students may obtain permission to arrange for suitable off-campus housing, which must also meet with their parents' approval, by filling out the appropriate forms in advance in the office of the Associate Dean of Students. Such off-campus housing is not officially under University inspection or supervision; therefore, the University cannot assume responsibility for students living off-campus. However, the University reserves the right to move students whose conduct or quarters are found to be undesirable.

Graduate students and women over 23 may live in the residence halls if space is available, providing they conform to all regulations of the residence units in which they live.

Married women may live in the residence halls only with special permission of the Associate Dean of Students. Students in women's residence halls must report changes in marital status immediately.

HEALTH SERVICE

Student Health Service. This service is maintained for the purpose of constant supervision over the health of students. It is administered under the office of the Associate Dean of Students. A dispensary and infirmary are staffed by physicians and registered nurses.

A physical examination, done within six months prior to registration, by a practicing physician and surgeon and recorded on a form provided by the University, is required of all new students who register for more than six class hours before registration can be completed. Also required is a certificate of smallpox vaccination done within the past three years. A chest X-ray is required as part of the physical examination, but if a report of one is not enclosed, the student may have an X-ray made at the Student Health Service on dates announced during the summer, or during Orientation Week.

Former students who have not been in attendance at the University for a year or more will meet the same requirements as new students.

Students are urged to have all immunizations brought up to date, and all remediable defects, such as in eyes, ears, teeth, tonsils, etc., corrected in advance of matriculation to prevent possible loss of time from studies. The Student Health Service makes the recommendations concerning activities of students in which health may be a factor.

Dispensary and Infirmary Treatment. Dispensary services are available during regularly posted hours and at any hour for emergencies to all students registered for more than 6 semester hours. No illness will be cared for in the residence halls, nor will any prescription be made for a student not reporting in person to the Health Service. Bedside care will be given in the infirmary for one week per semester without charge. A very nominal charge is made after that time, should further care be needed. Students who do not have meal tickets at one of the University dining halls will pay for meals served while in the infirmary. There is no limitation on number of clinic visits. Contagious illness will be cared for in the infirmary whenever possible, but diseases requiring long periods of isolation must be treated either at home or in a local hospital at the student's expense.

Illness or Injury Must Be Reported. Any illness or injury must be reported to the Student Health Service without delay. A campus resident is required to report illness immediately to the head resident of his or her hall. Failure to do so may result in one being asked to leave the hall. Health reports are sent to the family physician upon request of the student. Parents will be notified at once of any serious illness or need for hospitalization; however, they are not routinely notified of all admissions to the infirmary.

Financial Responsibilities. With the payment of the General University Fee each semester, all regularly registered students are entitled to Student Health Service care according to established policies. Students may be referred to consultant specialists when the University physicians consider it advisable, but such fees must be borne by the student. When hospitalization is considered necessary, the University assumes no financial responsibility. Parents are consulted in advance of hospitalization if at all possible.

PLACEMENT CENTER

The Placement Center is maintained to assist undergraduates, graduates, and alumni in obtaining employment according to their training, ability, and experience. It is the purpose of the Center to serve the State, region, and nation by providing adequately trained personnel for business, industry, government, and education. Although the Placement Center does not guarantee placement, every effort is made to aid students and those in the field who desire placement assistance. Candidates for employment may register by filling out the appropriate forms. Upon registering, candidates receive full information and instructions relative to securing employment.

Student Placement. The Placement Center aids students attending the University in securing part-time and summer employment, both on and off the campus, which tends to supplement their income and educational goals. All students who are interested in on- or off-campus placement should register with this office.

Educational Placement. The Placement Center assists graduating students and alumni in obtaining teaching and administrative positions in elementary schools, secondary schools, and in institutions of higher education. It seeks, at the same time, to serve the best interests of these institutions by referring candidates adapted to their particular needs.

Commercial Placement. The Placement Center serves graduating students and alumni who are interested in commercial, industrial, and governmental placement. Efforts are made to place students in their chosen fields, and at the same time, aid employers to obtain properly trained personnel.

All correspondence should be addressed to the appropriate division in the Placement Center.

ALUMNI ASSOCIATION

The Alumni Association was organized under the leadership of Principal E. L. Storment in June, 1894. Keeping pace with the growth of the University, the Association employed a full-time executive secretary in September, 1947.

Membership. There are approximately 28,000 graduates including the class of 1965. All students become active members when they graduate. Those students who have attended the University at least one semester may become associate members.

Alumni House. The campus center for alumni of the University is Alumni House, situated just east of Old Main. Formerly the presidents' home, Alumni House was renamed on Dec. 2, 1960, by the Board of Regents.

Three presidents of the institution lived in the house, built in 1907: A. J. Matthews, Ralph W. Swetman, and Grady Gammage.

Alumni House includes offices of the Association's executive secretary, the editor of the alumni magazine, and alumni records offices, as well as meeting rooms and tastefully appointed living room and reception areas. Alumni, students, and faculty are encouraged to visit Alumni House.

Alumni Fund. Annual alumni giving was inaugurated in 1961. The Fund is used for scholarships, research grants, loan funds, or for other purposes deemed appropriate by the University.

Endowment Fund. Under the leadership of the late Clarence M. Paddock, '03, and Leona M. Haulot, '02, the Association raised an endowment fund of $10,000 for the assistance of worthy students. The fund has now increased to more thain $37,500 and more than 700 students have received aid from the fund. Loans are made only to juniors, seniors, or graduate students.

Alumni Magazine. The Association's official magazine, the *Arizona Statesman,* is published quarterly for all active members. Present circulation is 26,000.

Alumni Register. The Alumni Association maintains a card file of the names and addresses of all its active members. Since it is difficult to keep up with address and name changes, alumni and friends can be of real service by sending a post card to the Alumni Secretary giving changes.

Alumni Faculty Awards. The Alumni Association annually presents two awards to individual faculty members in recognition of distinguished teaching and professional achievement. The Distinguished Teacher Award is based on the professor's knowledge of his field, effective presentation and ability to stimulate students to their highest efforts. The Faculty Achievement Award is given a professor who gains recognition and brings credit to higher education through his contributions in the professional world.

SCHOLARSHIPS AND FELLOWSHIPS

ARIZONA STATE UNIVERSITY SCHOLARSHIPS

Regents' Scholarships. The Board of Regents has created a number of scholarships, which are awarded annually by Arizona State University, to new and currently enrolled students who meet the qualifications established by the Regents. The financial need of applicants is one of the factors considered in selecting recipients of these scholarships. Deposits are waived for all students awarded those Regents' scholarships which provide for the remission of fees (including non-resident tuition, if applicable).

Academic Scholarships. These scholarships are available to students who give promise of high scholastic achievement. They provide for the remission of the general University fee and, in the case of out-of-state students, non-resident tuition.

Reservation Indian Scholarships. Two four-year scholarships are awarded annually to Arizona Reservation Indians who have demonstrated ability in the fields of scholarship and leadership. These scholarships cover the general University fee for four years.

Art Scholarships. Two scholarships, covering the general University fee and, in the case of out-of-state recipients, non-resident tuition, are awarded each year through National Scholastic Art Awards to high school seniors who win this honor at the national competition. Application forms may be obtained by writing (not later than January of the year of graduation from high school) to National Scholastic Art Awards, 33 West 42nd Street, New York 36, New York. These scholarships are renewable annually for four years on the basis of continued achievement.

Foreign Student Scholarships. Graduate and undergraduate scholarships are available to qualified students from foreign countries who have previous satisfactory scholastic records and show promise of achievement in promoting good international relations. These scholarships cover regular registration and class fees and non-resident tuition. The ability to read and speak the English language is required.

Activity Scholarships. These scholarships are available to new and currently enrolled students who give promise of satisfactory scholastic achievement, of outstanding success for skills or talent in the institution's program of approved activities, and of developing desirable qualities of character and leadership. Freshmen must have graduated in the upper two-thirds of their high school classes in order to be considered for these scholarships. The scholarships listed immediately below make up the category, "activity scholarships." Although the promise of superior performance in extra-curricular activities is one of the factors considered in awarding these scholarships, the recipients must, nevertheless, have met the fundamental requirement of academic ability.

> Athletic Scholarships. These scholarships provide for the remission of the general University fee and, in the case of out-of-state students, non-resident tuition. In addition, recipients of these scholarships may qualify for room and board awards under the Sun Angel Scholarship Fund listed elsewhere in this section.
>
> Band Scholarships. These scholarships provide for the remission of the general University fee and, in the case of out-of-state students, non-resident tuition. A limited number of them also provide for the remission of fees for private music lessons.
>
> Choral Scholarships. These scholarships provide for the remission of the general University fee and, in the case of out-of-state students, non-resident tuition.
>
> Orchestra Scholarships. These scholarships provide for the remission of the general University fee and, in the case of out-of-state students, non-resident tuition. In addition, they may provide for the remission of fees for private music lessons.
>
> Voice and Piano Scholarships. These scholarships provide for the remission of fees for private music lessons. Two of them may also remit the non-resident tuition fee.
>
> Women's Physical Education Scholarships. These scholarships provide for the remission of the general University fee. They also provide for the remission of non-resident tuition where applicable.

All the Arizona State University Scholarships listed above may be renewed annually upon re-application by the student and approval by the Scholarship Committee.

SPONSORED SCHOLARSHIPS

The scholarships listed below are also offered through the University.

Accounting Scholarship Fund. This fund has been established through the

Department of Accounting and contributions from certain members of the Certified Public Accounting profession. Preference is given to juniors and seniors who have good scholastic records and who have financial need. Amount of the awards may vary, depending on need.

Lee Ackerman Engineering Scholarship. This $250 scholarship is awarded annually to an incoming freshman who plans to major in engineering. Scholastic aptitude, active and constructive citizenship, financial need, extra-class activities and the potential to become an outstanding engineer are considered in awarding this scholarship.

Ruth C. Ackerman Memorial Scholarships. These scholarships, established by Mr. Lee Ackerman in memory of his mother, Mrs. Ruth C. Ackerman, are available to students in any fields of interest, in variable amounts. Awards are based on academic performance, character, and financial need.

Advertising Club Scholarships. The Phoenix Advertising Club awards two $250 scholarships annually to outstanding junior or senior students majoring in advertising. Selection is made on the basis of demonstrated ability, promise of future success in the field, and need of financial assistance.

AiResearch Manufacturing Company Scholarships. Several scholarships of $500 each are awarded annually to senior students enrolled in Mechanical Engineering at Arizona State University. Basis for the awards are scholarship, future promise in the field of mechanical engineering, and financial need.

Steve Allen ASU Mass Communications Scholarship. This is a first semester cash award of $100 given by Steve Allen to an entering freshman majoring in journalism or radio-television. Recipient is selected on the basis of scholastic achievement, financial need, and interest in, and aptitude for, the study of mass communication.

Allstate Foundation Scholarships. A sum of money is provided annually for scholarships to students who will be teaching driver education in a high school immediately following the completion of their work. These scholarships are primarily given during the summer session. However, some funds are now available for assistance to in-service driver education teachers who wish to complete advanced courses or develop research projects.

Harold A. Alpert Art Scholarship. A $100 scholarship is awarded annually by Harold A. Alpert to an outstanding junior or senior art major. Selection will be made by the faculty of the Art Department on the basis of demonstrated ability and need for financial assistance.

Alpha Delta Kappa Scholarship. The Arizona Alpha Delta Kappa, International Honorary Teachers Sorority, offers an annual scholarship of $100 to a senior girl in the College of Education who plans to enter the teaching profession. Recipient will be selected on the basis of scholarship, leadership, financial need, and must be recommended by the faculty of the College of Education.

Alpha Lambda Delta Scholarship. This is a $50 award to an outstanding freshman girl for the first semester at Arizona State University. Recipient is selected on the basis of grades, extra-class activities, character, and financial need.

Altrusa Home Economics Scholarship. The Chandler-Mesa-Tempe branch of Altrusa International presents yearly a $150 scholarship to an outstanding high school graduate from Chandler, Mesa or Tempe enrolling in home economics at Arizona State University. Selection is made on the basis of need, scholarship, character, and leadership.

American Institute for Foreign Trade Scholarship. The American Institute for Foreign Trade awards annually a tuition-free scholarship to a male graduate of Arizona State University. This scholarship is valued at $1,490 and covers the total tuition for a full year at the American Institute for Foreign Trade. In naming the award, the following qualifications will be given consideration: (a) quality of scholarship throughout the undergraduate years, (b) personality and character, (c) genuine interest in living and serving abroad, (d) professional background, (e) business experience, and (f) financial need. Preference is given to men who are from 25 to 32 years of age. Application for this scholarship is made through the Scholarships and Financial Aids Committee at Arizona State University. The deadline for applying is April 15.

American Institute of Industrial Engineers Scholarship. The Central Arizona Chapter of the AIEE contributes annually a registration fees scholarship for a student in industrial engineering. Applicant must have a cumulative index of 2.50 minimum, show promise in the industrial engineering field, and must be in his junior or senior year.

American Legion—Wilma D. Hoyal Scholarship in Political Science. The American Legion Auxiliary, Department of Arizona, has established this scholarship of $100 for a student majoring in political science. Basis for selection is character, promise of success in the field, and financial need. This award is available to upper division students.

Architecture Scholarships. A number of scholarships are provided each year through the Architecture Foundation which administers the supporting contributions of the Central Arizona Chapter, American Institute of Architects, and other private associations, firms, and individuals.

Arizona Association of Independent Insurance Agents Scholarship. A sum of $150 is provided annually for scholarships for students studying specifically in the field of driver education who express an intent to follow a driver education program in the preparation of their professional education. The scholarships are limited to junior, senior or graduate students. Awards will be made upon recommendation from the Coordinator of the Driver and Safety Education Program with final approval of the Arizona Association of Independent Insurance Agents.

Arizona Association of Insurance Agents Scholarship. This scholarship is available to a junior or senior student majoring in insurance at Arizona State University. This annual scholarship is for $200, payable $100 per semester. Applicant must be a resident of Arizona and enrolled in the College of Business Administration.

Arizona Bankers Association Fellowship. This is an annual $900 Fellowship for a graduate student in the College of Business Administration. Recipient will be expected to prepare a research project, preferably in a field related to banking. This award is payable $300 per semester and $300 upon completion of the project. Recommendation for this award must be made by the Faculty Committee in the finance area and the Dean of the College of Business Administration.

Arizona Cattle Feeders Association Scholarship. This is a $500 scholarship made available through the Arizona Cattle Feeders Association. Recipient must be enrolled in the agriculture curriculum in the animal science field. Recipient is selected on the basis of promise in the field and financial need.

Arizona Dietetic Association Scholarship. An annual award of $150 is given to an outstanding senior majoring in foods and nutrition who plans to take an internship following graduation.

Arizona Education Association Scholarships. The Arizona Education Association annually makes available two scholarships of $350 each to junior or senior Arizona State University education students. Recipients must be legal residents of Arizona. To be considered in the selection are professional attitude and leadership, character, financial need, and general worthiness.

Arizona Federation of Music Clubs Scholarship. This is an annual scholarship of $80 to a woman student in music education. Open to Arizona residents only, and awarded upon recommendation of the piano faculty.

Arizona Parks and Recreation Association Scholarship. This is a $100 scholarship for a student enrolled in the recreation curriculum. Recipient is selected on the basis of grades, character, promise of success in the field, and financial need.

Arizona Society of Certified Public Accountants Educational Foundation Scholarships. This foundation provides several scholarships of $125 per semester for accounting majors at the junior or senior level. Recipients must have a minimum cumulative index of 2.50 and be recommended by the faculty of the Accounting Department of the College of Business Administration.

Arizona State Federation of Garden Clubs Scholarship. This annual scholarship of $200 is awarded through the Arizona State Federation of Garden Clubs. The recipient must be a resident of Arizona, and must be enrolled in horticulture or its related fields. Preference will be given to applicants in their junior or senior year, and will be based on general ability and promise in the field of horticulture, cognizance of community needs in this field, and financial need.

Arizona State University Nursing Scholarship Fund. This fund has been established for the purpose of giving scholarship aid to students interested in a career in nursing and who are enrolled in the School of Nursing at ASU. Selection is made on the basis of character, high ability and promise in the field of nursing, and financial need. Amount of the award may vary, depending on need and availability of funds.

Arizona State University Piano Scholarship Fund. This fund is maintained by proceeds from recitals given by Dr. Donald J. Isaak, professor of music at Arizona State University. These cash stipends are awarded in varying amounts to worthy piano majors.

Arizona State University Unrestricted Scholarship Fund. This fund is maintained by contributions from donors who desire to remain anonyomus. Criteria used in selecting recipients are high scholastic achievement, extra class activities, and financial need. Awards may vary in amount. There is no restriction as to field of study.

Arizona Water and Pollution Control Association Scholarship. This is an annual award up to $150 for a senior or graduate student in the field of engineering, preferably in the sanitary program. Recipient must be a resident of Arizona and enrolled as a full-time student. Selection is based on scholastic ability, promise in the field, and financial need.

Associated Women Students Scholarship. This $250 scholarship is awarded by the Associated Women Students of Arizona State University to an

Arizona high school senior girl, outstanding in scholarship, personality, and extra-curricular activities. She must be willing to take an active part in the AWS program.

Bagdad Copper Corporation Scholarships. Mr. David C. Lincoln, President, Bagdad Copper Corporation, awards two scholarships of $500 each per year for two years. Applicants must be incoming or present full-time students, undergraduate or graduate, in any field of university study, who are employees or children of employees of the Bagdad Copper Corporation or Arizona Chemcopper Corporation. Selection is based on comparative merit, without relationship to race, religion, national origin, or rank of parent within the corporation. Application should be made directly to the Scholarships and Financial Aids Committee.

Herman Barnikol Scholarship Fund. This fund provides scholarships for American Indian students at Arizona State University. Awards are made in varying amounts, depending on the extent of financial need. Basis of selection is scholastic attainment, character, promise of success in his or her chosen field, and financial need.

Ellarie S. Becker Memorial Award. The National Secretaries Association, Valley of the Sun Chapter, provides a $200 scholarship annually to a second, third or fourth year woman student studying for the secretarial profession at Arizona State University. Scholastic attainment, citizenship, and financial need will be considered in making this award. The recipient of this award must be a resident of Arizona.

T. J. Bettes Foundation Grant. This grant of $250 per year is available to an outstanding high school senior who plans to enter the real estate, finance, or mortgage banking fields. The grant is renewable for the entire four-year college period, provided the recipient maintains a minimum grade point average of 2.75.

T. J. Bettes Foundation Fellowships. Two $500 graduate Fellowships are available in the real estate, finance or mortgage banking areas. Recipients are required to write a thesis in one of the three fields indicated above.

Borden Agricultural Scholarship. An annual scholarship of $300 is provided by the Borden Company Foundation, Incorporated, to the senior student in agriculture who has achieved the highest average grade of all similarly eligible students in all college work preceding their senior year.

British Marshall Scholarship. In gratitude for Marshall Plan Aid, the British Government annually offers 12 scholarships at British universities to graduates of U. S. colleges and universities. Arizona State University students are eligible to apply in their senior year. Selection is made on the basis of distinction of intellect and character. The scholarships are valued at from 550 to 800 pounds a year.

Business Administration Scholarship Fund. This fund has been established by anonymous donors for students who plan for a career in business. Scholarships up to $300 annually may be awarded. Selection will be made on the basis of scholastic ability, promise in the field and financial need.

Central Arizona Chapter of the American Society of Heating, Refrigerating, and Air Conditioning Engineers Scholarship. This scholarship is available to a junior or senior student in mechanical engineering in the area of thermodynamics. This annual scholarship is for $300, payable $150 per semester. Applicant must be a resident of Arizona. Recipients will be selected on the basis of scholarship, character, high ability, promise of success in the profession, and financial need. Applicants must be interviewed.

Central Chapter, Arizona Society of Professional Engineers Scholarship. This is an annual $300 scholarship for an incoming freshman engineering student. Recipient must be a resident of Arizona. Selection will be based on scholastic ability and financial need.

Chambers Belt Company Scholarship. This is a $1,200 scholarship available to a student in the College of Business Administration. Recipient must be a male student and a resident of Arizona of at least 2 years standing. Preference is given to a student who plans to enter small business management. The scholarship is payable at $150 per semester for four years.

Civitan Club of Phoenix Scholarships. The Civitan Club of Phoenix awards annually one or more scholarships in the amount of $230 to handicapped Arizona students. Awards are based on scholarship, character, and ability. Financial need is a primary consideration.

Concrete Pipe Industry of Arizona Scholarship. This is an annual $500 scholarship for a male student in the civil engineering curriculum. Recipient must be a resident of Arizona of at least 6 years standing, must be entering his junior year at the time of the award and must have a "B" average. The scholarship may be renewed for the senior year.

Congress Construction Company-Allen Layne Scholarship. This is a $250 annual scholarship for a full-time student in the College of Architecture, majoring in construction. Selection is made on the basis of grades, character, promise of success in the field and financial need.

Construction Industry Scholarships. A number of scholarships are provided each year through the Construction Fund which administers the supporting contributions of numerous private associations, firms, and individuals in the construction industry.

Creighton Scholarship. The Creighton Teachers annually offer a $125 scholarship to a graduate of the Creighton Schools in Phoenix who is preparing for the teaching profession at Arizona State University. The recipient must be a junior or senior and will be selected on the basis of professional attitude and leadership, character, financial need, and general worthiness.

Danforth Graduate Fellowships. Approximately 120 fellowships for study at accredited graduate schools in the U. S. are awarded yearly by the Danforth Foundation to young men preparing for careers in college teaching. Senior men at Arizona State University may apply for these fellowships, which carry maximum annual grants of $1,800 for single fellows and $2,800 for married fellows, with an additional stipend for children. The Foundation is looking for men with outstanding academic ability, personalities congenial to the classroom, and integrity and character, including serious inquiry within the Christian tradition.

Delta Nu Alpha Transportation Fraternity Scholarship. Arizona Alpha Chapter No. 73 of Delta Nu Alpha Transportation Fraternity awards a $100 scholarship annually to an outstanding student majoring in transportation. Selection is made from Arizona residents on the basis of scholarship, future promise, and financial need.

Herman E. DeMund Memorial Scholarship. This is an annual $1,000 scholarship for a deserving student at Arizona State University. Selection is made on the basis of scholastic ability, financial need, and without restriction as to race, religion or sex.

Herman E. DeMund Memorial Scholarship. This is an annual $1,000 scholarship for a deserving *Graduate* student at Arizona State University. Selection is made on the basis of scholastic ability, financial need, and without restriction as to race, religion or sex.

Diamond's Scholarship. Two $250 scholarships are given annually by Diamond's of Phoenix. These scholarships are payable $125 per semester. Recipients must be full-time students in the College of Business Administration, enrolled in the marketing curriculum. Selection is based on scholastic ability, character, and desire to succeed in the field.

Dunbar Builders Corporation Scholarship. This is an annual $1,000 scholarship given by the Dunbar Builders Corporation of Chicago. Recipient must be enrolled for a full course of study at Arizona State University. Award is based on scholastic ability, character, promise of success in his field, and financial need. This scholarship may be renewed for the undergraduate years.

Eastern Star Scholarship. The Grand Chapter of the Order of the Eastern Star of Arizona awards annually a $200 scholarship to a graduate of an Arizona high school. The scholarship is awarded to a junior or senior in college. The recipient must be a member herself, or the daughter of a member, of a regularly chartered chapter of the Order of Eastern Star in Arizona. In selecting the recipient, character, leadership, and scholarship will be given primary consideration.

Eastern Star Scholarship in Nursing. The Grand Chapter of the Order of the Eastern Star of Arizona awards annually a $200 scholarship to a junior or senior enrolled in the School of Nursing. Recipient must have graduated from an Arizona High school, must be a member herself or the daughter of a member of a regularly chartered chapter of the Order of Eastern Star in Arizona. In selecting the recipient, character, leadership, and scholarship are given primary consideration. Application forms are available in the Scholarship Office. Deadline for application on campus is May 1.

Engineering Opportunity Awards. These scholarships are available to students majoring in engineering. Scholastic aptitude, the potential to become an outstanding engineer, and financial need are the criteria for selection. Amount of the award may vary depending on financial need.

David Epstein Agricultural Scholarship. This award provides $100 annually for a student in the Division of Agriculture. Basis for the award is academic standing with need a primary consideration. This scholarship is not restricted to residents of Arizona.

Executives' Secretaries Incorporated Scholarship. The Phoenix Chapter of Executives' Secretaries, Inc., offers annually two scholarships of $250 each. These are available to women residents of Arizona majoring in secretarial or business administration. Applicants must have a minimum grade average of "B" and must have completed at least one year of college.

Fulbright Scholarships. These are awards made by the U. S. Government for graduate study in 31 foreign countries. Arizona State University seniors are eligible to apply. The awards cover the cost of transportation, tuition, books, and maintenance for one academic year's study abroad. Selection is made on the basis of applicant's personal qualifications, academic record, value of the proposed graduate study or research, and suitability for placement in an institution of higher learning abroad. Most, but not all, of the awards require that applicants speak the language of the country for which they apply.

Charles and Edith Getz Scholarship. This $200 annual scholarship is available to a graduate of an Arizona high school. Preference will be given to a student of the Hebrew faith. Recipient will be selected on the basis of academic performance, leadership qualities, good character and financial need. The scholarship is renewable for three additional years provided the student maintains a minimum index of 3.0 ("B" average).

George Ghiz Engineering Scholarship. This is an annual $250 scholarship for a student in the College of Engineering Sciences. Recipient must be majoring in mechanical engineering; be in the junior or senior year; have a cumulative index of at least 3.0; and must have taken his freshman and sophomore work at Arizona State University.

George Ghiz Scholarship. This is an annual $250 scholarship for a student in the College of Business Administration. The recipient must be majoring in, or planning to major in, sales and marketing. This scholarship may be renewed for the undergraduate years provided the recipient carries a minimum of 15 hours per semester with an index of 3.0.

Kemper Goodwin Scholarship. Kemper Goodwin, Tempe architect, has established this $800 scholarship to be awarded each year to a graduate of Tempe Union High School. Financial need will be the primary consideration in selecting the recipient, although the ability to do at least average college work will be required. The scholarship will be disbursed to the recipient at $100 a semester for four years.

Goodyear Scholarship. Annually the Goodyear Foundation awards a $1,000 scholarship to a student at Arizona State University. Applicant must be (a) a male citizen of the United States; (b) be acceptable as a junior or senior student; (c) desire to enter business or industry upon graduation; and (d) require financial assistance. Criteria used in selection of the recipient are high academic standing, character and leadership qualities, and financial need. Applicants for this scholarship will be interviewed by the Scholarship Committee. There is no obligation on the part of the recipient or the company with respect to employment following graduation.

Arthur Emery Harvey Scholarship in Applied Music. A scholarship in applied piano is given yearly by Hazel Harvey Quaid to the freshman ranking highest in piano sight-reading, repertoire and general musicianship. Examinations are given during Freshman Week.

Heard Museum Auxiliary Scholarship. This is an annual $400 scholarship for a student enrolled in the College of Liberal Arts, majoring in anthropology. Recipient is selected on the basis of grades, character, promise of success in the field, and financial need. The award is payable at $200 per semester.

Hiram Club Scholarship. The Hiram Club No. 1 of Phoenix annually makes available a $50 scholarship to a junior or senior student enrolled in the elementary curriculum. Qualifications for this scholarship, which is for the second semester of the academic year, are financial need and the potential of becoming an outstanding teacher.

Inspiration Consolidated Copper Mining Company Scholarship. This award is for a *Graduate* student in geology, who has maintained a "B" average during the year previous to application for the scholarship. The amount is for $750 for the first year and renewable for the second year at $1,500, provided the recipient continues to earn the necessary "B" average. Selection of the recipient is made by the faculty of the Department of Geology.

Irish Hall Scholarship. The residents of Irish Hall, men's residence hall, present this annual $200 scholarship, preferably to an upperclassman who has resided in the hall at least one semester. Selection is based on financial need.

Dr. B. Ira Judd Scholarships. The Arizona State University Chapter of Blue Key awards several scholarships to male graduates of Arizona high schools. These scholarships are for $200 annually and are awarded on the basis of scholarship, character, participation in extra-curricular activities, and financial need. The scholarship may be renewed for the undergraduate years provided the recipient maintains at least a "B" average.

Alfred Knight Scholarship Endowment Fund. This fund provides for several scholarships annually to outstanding graduates of Arizona high schools who have indicated a desire to continue their education in pure or applied mathematics and the sciences. Recipients will be selected primarily on the basis of scholarship, character, and future promise. The amount of the award will be dependent on the financial need of the student as well as scholarship.

Dr. A. L. Krohn Scholarship. This is an annual $250 scholarship offered to an incoming Arizona State University freshman whose field of interest is literature. Financial need is a primary consideration in selecting the recipient.

La Liga Panamericana Scholarship. This is an annual $300 scholarship available to a graduating senior of an Arizona high school who is of Mexican-American descent. Recipient must plan to enroll in the College of Liberal Arts or the College of Education, major in Spanish, and carry a minimum of 12 semester hours. Basis of selection is grades ("B" average or better) and financial need. The scholarship is payable at $150 per semester. Recipient must earn at least a 2.50 index for the first semester.

League of Business and Professional Women of Phoenix Scholarship. This scholarship of $250 annually is available to a woman student who plans to enroll in nursing or associated studies. Recipient must be a resident of Arizona, preferably of Maricopa County. The scholarship may be awarded in the freshman year and is renewable provided the student is making normal progress toward a degree.

Maricopa County Osteopathic Association Scholarship. This award is an annual $307 scholarship for a second, third or senior year student in the School of Nursing. Recipient will be selected on the basis of character, personality, leadership, high ability and promise, and need.

Maricopa Subsection, Arizona Institute of Mining Engineers Scholarship. A $100 scholarship awarded annually to a graduate student in mining geology. Recipient must be recommended by the faculty of the Geology Department on the basis of ability and need.

Mary Helen Martin Memorial Scholarship. This fund is established as a memorial to Mary Helen Martin, graduate of Scottsdale High School and a former student at Arizona State University. It provides an annual scholarship of $300 to be awarded to a girl graduate of Scottsdale High School for her freshman year at ASU. Recipient must be a resident of Arizona, graduate at least in the upper quarter of her class, have the potential to succeed in her chosen field and have need for financial assistance.

Howard Martindale Scholarship. This $1,000 scholarship award is available to graduating seniors of Arizona high schools. Selection is based on high scholastic ability, worthy character, and financial need. This scholarship is renewed annually for three additional years on the basis of continued academic performance. Applicants must be residents of Arizona.

Carl Leroy Meng Engineering Scholarship. This scholarship, established by Mrs. Carl Meng in memory of her husband, is available annually to an incoming Arizona State University freshman who plans to major in engineering. The amount of the scholarship is $100 and there is no restriction as to the field of engineering. Scholastic aptitude, integrity, future promise, and financial need are the criteria for selection.

Miami Copper Company Scholarship. This scholarship is for a *Graduate* student in geology, who has maintained a "B" average during the year previous to application for the award. The amount is $750 for the first year and renewable for the second year at $1,500, provided the recipient continues to earn the necessary "B" average. Selection of the recipient is made by the faculty of the Department of Geology.

Music Camp Scholarships. These scholarships, providing one academic year's applied music lesson fees (not to exceed $40 a semester) are awarded annually by the University to gifted members of the Music Camp—one each in voice, piano, and instrument. Applicants are selected on the basis of auditions given at the University.

National Association of Accountants. The Phoenix Chapter of the National Association of Accountants awards an annual $200 scholarship to a student in the College of Business Administration majoring in accounting. Applicant must be at least in his junior year, must carry a minimum of 15 hours per semester, and have a grade average of "B."

National Association for Retarded Children, Inc. Scholarship. The Maricopa County Council, NARC, has established a $350 scholarship, available primarily to students preparing to become teachers of retarded children. Application must be filed with the Scholarship Committee. Awards will be made on recommendation of a special committee through the College of Education and the Maricopa County Council, NARC. Recipient will be selected on the basis of interest in this field, aptitude, and maturity.

National Securities, Inc. Scholarship. An annual scholarship of $250 is offered by National Securities, Inc., a holding company with interests in finance, insurance and land development. This scholarship is available to a junior male student in the College of Business Administration. Selection is based upon scholastic ability, character, personality, leadership, aptitude and desire to succeed in the business field in Arizona. Recipient must carry a minimum of 15 hours per semester. The scholarship is renewable for the senior year on the basis of continued performance as specified. The recipient may be offered a position at National Securities, Inc., upon graduation.

Noontimers Business and Professional Women's Club Scholarship. This is an annual award of $150 for a girl graduate of an Arizona high school interested and enrolling in some phase of business administration at Arizona State University. The scholarship is payable at $75 per semester.

Nursing Traineeships. Students with demonstrated interest and potential for graduate work in psychiatric-mental health nursing may apply for Psychiatric-Mental Health Trainee Stipends for their junior and/or senior years. These stipends are offered through the National Institute of Mental Health. Registered nurse students who have been or will be going into supervisory, administrative, or teaching positions in nursing, and are within twelve months of completing degree requirements, may apply for Professional Nurse Traineeships, offered through the Public Health Service, Department of Health, Education and Welfare.

Registered nurse students within twelve months of completing degree requirements planning to enter full-time public health nursing may apply for Public Health Nursing Traineeships, offered through the Public Health Service, Department of Health, Education and Welfare.

All traineeships provide tuition, fees, a $200 monthly stipend, and allotments for dependents. Application should be made through the College of Nursing prior to April 1.

Armed Forces Nursing Scholarships. Qualified nursing students may apply for armed forces scholarships which provide monthly allotments, tuition and other benefits during the junior and senior years. Further information may be obtained through the College of Nursing office.

Billie Loy Pearce Scholarship. This is an annual $200 scholarship awarded to a graduate of an Arizona high school. Primary criterion for selection is financial need, although the student must have earned at least average grades. This scholarship is renewable annually provided the recipient maintains a "B" average.

P. E. O., Chapter AL Scholarship. This is an annual scholarship of $200. Recipient must be a girl graduate of an Arizona high school. Basis for selection shall be character, academic performance, and financial need. Recipient may enroll as a full-time student in any curriculum.

Phelps Dodge Scholarships. These scholarships of $1,000 each, are awarded annually to graduating seniors of Arizona high schools. One of these scholarships is designated for a high school graduate from the Ajo, Bisbee, Douglas or Morenci-Clifton areas. Selection is based on high scholarship, high ability and promise, personality, character, and leadership. These scholarships are renewable for three additional years on the basis of continued accomplishment.

Phelps Dodge Graduate Scholarships. Two graduate scholarships of $1,200 plus tuition are awarded annually as follows: One award to a male student in engineering, with preference given to candidates in the advanced study of mining, geology, metallurgy, or allied fields in the mineral industry. One award to be made to an outstanding student for advanced study in any field. Recipients must be graduates of Arizona State University.

Phoenix Blue Print Company Scholarship. This is an annual $500 scholarship fund designated for awards to students in architecture or engineering, and available to graduate or undergraduate applicants. Recipients will be selected on the basis of scholarship, character, and promise of success in their fields. Amount of scholarship may vary depending on financial need.

Phoenix Junior Chamber of Commerce Band Scholarship Fund. The Sun Devil Band performs annually at the Phoenix Junior Chamber of Commerce World Championship Rodeo, and in return the J.C.'s contribute $2,000 to the Band's scholarship fund each year. Cash awards, to defray part of the cost of room and board, are made from this fund to Arizona State University Band scholarship recipients who qualify.

Phoenix Symphony Orchestra Guild Scholarships. The Phoenix Symphony Orchestra Guild provides a fund annually for cash awards to graduate and undergraduate students enrolled in full-time studies at Arizona State University. The cash stipend may vary in amount. Recipients are required to audition for membership in the Phoenix Symphony Orchestra.

Phoenix Symphony Orchestra Scholarships. Two scholarships are provided annually by Arizona State University to full-time students registered under a four-year curriculum. These scholarships provide for the remission of registration and class fees, non-resident tuition fee, and private music lessons fee. Aptitude and proficiency in music as shown by performance on a musical instrument, promise of further growth and development in musicianship, and good character will receive primary consideration. Recipients must audition for membership in the Phoenix Symphony Orchestra.

Phoenix Traffic Club Scholarship. This is an annual $100 scholarship available to a student in the College of Business Administration who is interested in the field of transportation. Recipient must be entering his junior year. Selection is based on scholarship, future promise, and financial need.

Kathryn Barron Pickrell Scholarship. This award is for $300, payable $150 at the beginning of each semester, and is designated for a graduating senior of South Mountain High School who plans to attend Arizona State University. This scholarship is donated by Mr. and Mrs. W. W. Pickrell of Phoenix. Basis for selection is academic honors, general ability and promise, and financial need.

Prix Francais Scholarship. This is an annual scholarship of $400 for a student majoring in *French.* An additional $100 per session is available if recipient wishes to attend summer sessions. Candidates for this scholarship must have a cumulative index of at least 3.0, with no single grade in the major subject below a "B"; carry 15 hours per semester; be enrolled concurrently with the granting of the award in at least one upper division course in French. The scholarship is renewable for the undergraduate years, provided the recipient maintains the necessary criteria. Selection is based on grades, character, promise of success in the field and financial need.

Provident Security Life Insurance Company of Arizona. This is a $250 scholarship available to a student in the College of Business Administration who is majoring in life insurance. Recipient must be at least in his junior year, must be a resident of Arizona, and must have a desire to succeed in the insurance field. Basis for selection is scholarship, leadership, character, personality, and financial need. The scholarship is renewable for the senior year.

Reynolds Anthropology Scholarship. Mr. and Mrs. R. K. Reynolds provide an annual scholarship of $500, payable $250 per semester, for a student majoring in anthropology. Recipient must be recommended by the faculty of the Department of Anthropology. The basis for the award is promise of success in the field and financial need, without regard to race, color or creed.

Justine Ward Riseling Memorial Scholarship. The Salt River Valley Branch of the Association for Childhood Education International offers, in memory of Justine Riseling, who was a teacher in the Phoenix School system, a scholarship of $50 annually to a second-semester junior or senior student enrolled under the elementary curriculum. In making this award, scholarship, character, leadership, and financial need will be given primary consideration.

A. B. Robbs Trust Company Merit Scholarships. These non-renewable scholarships are available to seniors graduating from Arizona high schools who are interested in pursuing study in the specific fields of business administration and real estate. One thousand dollars is awarded annually on the basis of high scholarship, demonstrated financial need, character and promise, as follows: (1) A maximum of $150 annually to a student with high scholastic standing and no financial need; (2) a maximum of $500 annually to a student with high scholastic ability and great financial need.

Robbs, Hester and Alexander Insurance Scholarships. Two scholarships, in the amount of $500 each, are available annually to insurance majors in the College of Business Administration. Recipients must be enrolled as full-time students, give evidence of promise of success in the field, and earn at least average grades. Scholastic ability, character, and financial need are the criteria for selection of candidates. These scholarships may be renewed if the recipient maintains the necessary criteria.

Rhodes Scholarships. These are competitive scholarships for which Arizona State University junior and senior men are eligible to apply. The scholarships are for study at Oxford University, England, and carry a stipend of 600 pounds a year. They may be held for three years. Qualities considered in making selection are: (1) literary and scholastic ability and attainments, (2) qualities of manhood, truthfulness, courage, devotion to duty, sympathy, kindliness, unselfishness and fellowship, (3) exhibition of moral force of character and of instincts to lead and take an interest in his fellows, (4) physical vigor, as shown by fondness for and success in sports.

St. Augustine's Episcopal Church Scholarship. This award is for $200 annually to an Arizona State University student who is a member in good standing of the Episcopal Church. Basis for consideration is given to the applicant's scholastic ability, which must be at least average, and financial need.

Sales and Marketing Executives of Phoenix Scholarship. This is an annual scholarship of $300 for a junior or senior student in the College of Business Administration, majoring in marketing and sales. Recipient must be a full-time student, carry a minimum of 15 hours per semester and have a cumulative index of 3.0. Recipient will be selected on the basis of financial need, academic performance, career objectives and activities directed to advancing the field of marketing and sales.

Salt River Project Water Resources Scholarship. This is an annual $500 scholarship available to a junior or senior male student in the College of Engineering Sciences, with a special interest in Water Resources. Applicant must be a resident of Arizona, have a cumulative index of 2.50, and carry a minimum of 15 hours per semester. Recipient will be selected on the basis of grades, character, promise of success in his field, and financial need.

Scottish Rite Fellowships. Applicants must have an A.B. or B.S. from an accredited college or university and at least a "B" average scholastically. This award is for $1,800 annually for study at George Washington University in Washington, D.C. This fellowship may be applied for by a graduate of Arizona State University. The purpose is to educate students for leadership in government, federal, state, or local. Final selection will be made by the Arizona Consistories Educational Committee.

J. Lester Shaffer Insurance Scholarship. This is an annual scholarship for a student in the insurance curriculum at Arizona State University. The amount of the award is $250, payable $125 per semester. Recipient must be recommended by the Insurance Department and will be selected on the basis of scholarship, ability, promise of success in the insurance field, and financial need.

Sigma Delta Chi-Pulliam Scholarships. These annual $1,000 scholarships are given by Mr. Eugene Pulliam, publisher of the *Arizona Republic* and *Phoenix Gazette.* These awards are available to journalism students in their junior year, with preference given to members of Sigma Delta Chi who plan a career in the newspaper field. Applications must be made through the Scholarship Office. Candidates must be recommended by a committee of selection composed of the chairman of the Department of Mass Communications, members of Sigma Delta Chi, and the Scholarship Committee. These scholarships are renewable for the senior year provided the recipient maintains at least average grades and continues to demonstrate promise to develop a strong commitment to go into newspaper work.

Sperry Phoenix Electrical Engineering Scholarship. This is an annual $500 scholarship for a student in the electrical engineering curriculum. Recipient must be at least in his junior year and must have taken his sophomore and freshman work at Arizona State University. Recipient must show evidence of sound character, good citizenship, promise of success in his field, and financial need.

Structural Engineers Association of Arizona Scholarship. This annual scholarship of $100 is available to a junior or senior male student in the Civil Engineering curriculum with special interest in Structural Engineering. Recipient must be a resident of Arizona. Basis for selection is grades, character, promise of success in the field and financial need.

Sun Angel Foundation Scholarship Fund. The Sun Angel Foundation, an organization of civic and business leaders dedicated to assist in the growth of Arizona State University, each year contributes scholarship funds to the University. In selecting the recipients of scholarships provided by this fund, priority will be given by the ASU Scholarship Committee to students who: (a) want a college education; (b) have the scholastic aptitude to profit from a college education; (c) preferably have demonstrated ability in one or more recognized extra-class activities; (d) have been active and constructive citizens; (e) lack the financial resources to cover all or any part of tuition, fees, room and board. The Foundation has designated that these funds shall be used to provide:

(A) *Engineering Scholarships.* Five (5) for freshmen, $200 each.

(B) *Agricultural Scholarship.* One (1) for a freshman, $400.

(C) *Activity Scholarships.* Provide funds to help defray room and board costs for a limited number of Arizona State University Activity Scholarship recipients, the amount of the award to be determined by financial need.

(D) *Other Scholarships.* Scholarships covering all or any part of tuition, fees, books, room and board, the amount of the award depending entirely on the extent of financial need. Application for one of these scholarships may be made by any student who feels he meets *all five* of the criteria of selection listed above. These awards are not limited to holders of Arizona State University Scholarships. The number of awards provided, however, is limited by the amount of funds available.

(E) *Business Scholarships.* The number of awards and the amount may vary, but the average award is $200 annually. These are renewable if satisfactory grades are maintained.

(F) *Architecture Scholarships.* Two (2) scholarships of $200 each to students who show promise in the field of architecture.

Sun Angel-Funk Endowment Scholarship Fund. Scholarships from this fund are available to undergraduate students in any field of study in varying amounts. Recipients are selected on the basis of scholastic ability, character, extra-curricular activities, leadership and financial need.

Tempe Boy Scouts Scholarship. This is a $250 scholarship to a graduating senior of the Tempe Union High School who has had a minimum of three years in Boy Scouting, and who has attained at least First Class rank in scouting. Applicant must be a resident of Arizona. Scholastic achievement, extra class activities, and financial need will be the criteria for selection.

Tempe Business and Professional Women's Club Scholarship. This is a $200 annual scholarship for an entering freshman. Recipient must be a girl graduate of Tempe Union High School, must be in the upper quarter of her class, must have the desire and the potential to succeed in her chosen field, and financial need.

Tempe Kiwanis Club Scholarship. A scholarship of $250 is awarded annually by the Tempe Kiwanis Club to a handicapped Arizona student. Preference will be given to a local student and need will be given primary consideration. Other qualifications include: ability, scholarship, and character.

Margaret Ann Tetrick Scholarship Fund. This fund is established by Miss Margaret Ann Tetrick to help worthy and needy students. Recipients may be in any field and must have a desire to obtain a college education and financial need.

E. A. Thomas—Arizona Wholesale Supply Company Scholarships. These scholarships are available to students whose parent or parents are employed by the Arizona Wholesale Supply Company, and who have financial need to obtain a college education. These awards will be made in varying amounts according to need, but will not exceed $900 per student in any academic year. These scholarships are renewable provided the student maintains a satisfactory grade average of "B" or better.

Root Tilden Law Scholarships. National competition for these 20 fellowships, valued at $6,900 each, is open to senior men at Arizona State University who wish to study at the New York University School of Law. Candidates will be chosen on the basis of high scholarship, active extra-curricular participation and potential capacity for unselfish public leadership.

Hotel Tropicana (Las Vegas) Scholarship. This is an annual scholarship fund of $890 available to women students who participate in the tennis program at Arizona State University. Applicants must be enrolled as full-time students, carrying a minimum of 13 hours per semester with a cumulative index of 2.0. Incoming freshmen must have graduated in the upper two-thirds of their high school class. Recommendations for recipients of these awards are made by the women's tennis coach with the approval of the head of the Women's Physical Education Department. Selection is based on grades, character, ability and active participation in tennis.

Union Rock and Material Company Scholarship. This is a $1,000 annual scholarship given by Union Rock and Material Company. The award is for $250 per year for the four undergraduate years. Preference is given to male students who plan to teach Business Administration, or students in the engineering field. Recipients are selected on the basis of grades, character, promise of success in the field and financial need.

Valley National Bank Scholarships. The Valley National Bank offers annually 16 scholarships at $250 each, payable $125 per semester. Applicants may be registered in any field, must be enrolled for a full course of study, and must be residents of Arizona. Selection will be made on the basis of scholarship, character, personality, leadership, and financial need. These scholarships will usually be awarded four to each class, (freshman, sophomore, junior, and senior) but are renewable provided the recipient maintains the required standards.

Valley of the Sun Kiwanis Club Agriculture Scholarships. The Valley of the Sun Kiwanis Club, Phoenix, as one of its service projects, sponsors an Agriculture Scholarship Fund from which scholarships are provided annually to students at Arizona State University who are registered under the four-year agriculture curriculum. These scholarships provide for a cash stipend of $300 payable $150 each semester. Recipients must be residents of Arizona and be full-time students registered under the four-year agriculture curriculum. In making the awards, the primary factors to be considered will include: scholarship, ability and promise, personality, character, leadership, and financial need.

Vegetable Growers Association Memorial Foundation Scholarships. This Foundation makes available annually six scholarships of $500 each for worthy students of Arizona State University who are majoring in, or plan to major in, horticulture or its related fields. Applicants must be residents of Arizona.

Vesta Club Scholarship. The Vesta Club gives each year a scholarship of $1,000 to a worthy Spanish-speaking high school graduate of Arizona. This scholarship will be used to help defray the student's school expenses for four years, and will be given at the rate of $125 each regular school semester. The recipient will be given the choice of attending the Arizona State University, Arizona State College, or the University of Arizona. This award is made on the basis of character, need, scholarship, and promise of future success.

Veterans Organization Nursing Scholarships. These scholarships are provided by the Veterans of Foreign Wars, Post #8015; American Legion, Post #27; Forty and Eight, Voiture #1466; and American Legion Auxiliary, Post #27. The scholarships are available to juniors and seniors in the College of Nursing. They provide for registration fees, laboratory fees, and books for one to two years. Scholastic aptitude, the potential to become an outstanding professional nurse and financial need are the criteria for selection.

Western Electronic Education Fund. The Western Electronic Manufacturers Association has established a fund for scholarship awards to junior and senior students in electrical engineering. Amount of the awards depends on the financial need of the applicants.

John A. Whidtsoe Memorial Scholarship Foundation. The John A. Whidtsoe Memorial Scholarship Foundation of the Church of Jesus Christ of Latter-day Saints provides a $500 graduate scholarship, a $200 junior scholarship and a $200 freshman scholarship to active members in good standing of chapters of Delta Phi Kappa, returned missionaries honorary fraternity. Scholarship and character will be the basis for selection.

Gerry Wolfe Scholarship. This is an annual award of $200 made by Mr. Gerry Wolfe of El Paso, Texas, in recognition of the fine conduct displayed by the Arizona State University athletic teams during their visits to El Paso. This award is available to a student participating in athletics and is based on financial need.

Woodrow Wilson Fellowships. Faculty members at Arizona State University are each eligible to nominate candidates for the Woodrow Wilson Fellowships, of which 1300 are given annually. The fellowships are designed to attract to the college teaching profession young men and women who possess the highest qualities of intellect, character and personality. The minimum stipend is $1,800 plus tuition for single fellows. Married fellows will receive special consideration.

Applications. All applications, except for music or athletics, must be filed with the Scholarship Office on or before March 1 for entering freshmen, and May 1 for all others. Application forms may be obtained by writing to the Scholarship Committee, Arizona State University, Tempe, Arizona.

Applications for graduate scholarships and fellowships must be filed on or before February 15 with the Dean of the Graduate College.

Arizona State University student loan funds have been established through gifts, donations, and grants from alumni and friends of the University. These funds are entrusted to the University to aid worthy students who demonstrate financial need, maintain satisfactory scholarship, and who have a high sense of moral responsibility. For detailed information write: Director of Financial Aids, Administration Building, Arizona State University, Tempe, Arizona.

UNIVERSITY LOAN FUNDS

Loans are available for students enrolled in the University in a full-time program to meet the needs of any reasonable educational expense. The extent of this financial need must be clearly established by providing a complete statement of the applicant's financial resources and expenses for the academic year.

Loans are *not* available for any non-educational expense which is normally financed by a commercial lending institution, nor are they available for the repayment of any previously incurred indebtedness.

The maximum loan limit shall be determined by a number of considerations. One of primary importance is the ability to repay. Generally, undergraduate students may borrow in modest amounts repayable within the academic year or before the beginning of the next school year. For graduate students, such factors as degree program and professional objectives shall be taken into account in determining the extent of credit and repayment schedule. In most cases, future summer earnings are pledged for repayment. Most University loans carry a nominal rate of interest or a small service charge. Applications may be filed at any time during the school year.

Following are the individual loan funds established for the benefit of the students of Arizona State University.

John W. Allen Loan Fund. Established in 1954 by John W. Allen of Mesa, Arizona for the aid of worthy students whose grades and activities indicate a seriousness of purpose.

Alumni Loan Fund. Established by the Alumni Association of Arizona State University at the suggestion and initial donation of the Class of 1917, for use of worthy students with financial need.

Apfel-Carson-Wilson Memorial Loan Fund. Established in 1959 by the Bagdad Classroom Teachers Association of Bagdad, Arizona in memory of three Bagdad teachers who were killed in a plane crash. This loan fund is used for worthy students whenever unexpected and unavoidable circumstances create a financial emergency.

Arizona Federation of Business and Professional Women's Clubs Loan Fund. Established in 1964 for use of worthy students with financial need. Loans from this fund are restricted to students who are legal residents of Arizona.

Dorothy E. Bailie—Disabled American Veterans Loan Fund. Established in 1961 with funds bequeathed by Dorothy E. Bailie of Phoenix, Arizona. This fund was established for the benefit of disabled veterans, veterans, and their dependents who are upperclassmen or graduate students. Applicants must have a grade average of 2.50 or higher. The maximum amount that may be loaned to any one student is $300.00. Loans are interest-free until one year after graduation or withdrawal from school, when interest begins at a rate of 3%.

Austin S. Bratcher Memorial Loan Fund. Established in 1959 as a gift from the Purchasing Agents Association of Arizona in memory of Professor Austin S. Bratcher. This fund was established for students enrolled in the College of Business Administration.

Adele Lindeman Brown Loan Fund. Established in 1964 by a bequest from the estate of Adele Lindeman Brown, a 1912 graduate of Arizona State University, for the purpose of aiding worthy students to complete their college education.

Tom and Dorothy Chauncey Fund. Established in 1961 by Tom and Dorothy Chauncey of Phoenix, Arizona for worthy students with financial need.

Gertrude E. Claypool Loan Fund. Established in 1962 in memory of Mrs. Gertrude Claypool, of Phoenix, Arizona, an expert gardener and judge of flower shows. Preference for loans from this fund is given to worthy and needy students in the field of horticulture.

Faculty Wives Club Loan Fund. Established in 1963 for use of worthy students with financial need. Funds have been donated by the Faculty Wives Club of Arizona State University since 1959.

Dixon Fagerberg Revolving Loan Fund. Established in 1948 by the late Dixon Fagerberg of Prescott, Arizona. Loans from this fund are limited to junior and senior women. Repayment is made within two years after graduation or withdrawal from school.

Foreign Student Loan Fund. Established in 1955 by the Foreign Student Club of Arizona State University from funds donated to members of the club for speaking services rendered to organizations and groups. Loans do not exceed $125.00.

The Grady Gammage Memorial Loan Fund. Established in 1964 anonymously by a resident of Scottsdale, Arizona, for loans to worthy and deserving students in need of financial assistance in meeting their educational expenses.

Barbara Sandra Getz Memorial Loan Fund. Established in 1963 by Charles and Edith Getz, Tempe, Arizona in memory of their daughter Barbara Sandra Getz. Loans from this fund are made to worthy and needy students who have demonstrated academic proficiency and a seriousness of purpose.

Eleanore Gilbert Hall Loan Fund. Established in 1960 by Mrs. Eleanore Hall of Phoenix, Arizona, for use by students and faculty. Loans may be made only to those students who need money for necessities such as food, rent, medical care, etc. The maximum amount that may be loaned students from the Hall Fund is $200.00. Loans from this fund are interest-free for one year, with a rate of interest of 3% thereafter.

John Jacob Hausman Memorial Loan Fund. Established in 1964 by Dr. Grace Hausman. Loans from this fund are available to Arizona residents who are active members of the Arizona State chapter of Alpha Epsilon Pi. Preference is given to juniors and seniors who have need for financial aid in completing their college education.

Sallie Davis Hayden Memorial Loan Fund. Established in 1962 in memory of Sallie Davis Hayden of Tempe, Arizona, by members and friends of the Hayden family. Loans from this fund are made to worthy and needy students who have demonstrated academic proficiency and a seriousness of purpose.

Kappa Delta Pi Loan Fund. Established in 1964 by the Beta Phi Chapter of Kappa Delta Pi, an honor society in education. Loans are available for the use of students officially enrolled in the College of Education who are in need of financial assistance.

W. K. Kellogg Loan Fund. Established in 1943 with funds from the Kellogg Foundation of Battle Creek, Michigan. This fund is for use of students pursuing a course of study in the field of medical technology.

The League of Business and Professional Women of Phoenix Loan Fund. Established in 1963 for the purpose of aiding worthy and needy students who have demonstrated academic proficiency and a seriousness of purpose. Preference is given to women students. This fund is restricted to students who are Arizona residents.

Links, Inc., Loan Fund. Established in 1964 by the Phoenix Chapter of Links, Inc., a national women's service organization, for the purpose of aiding worthy and needy students who have demonstrated academic proficiency and a seriousness of purpose.

Marshall Foundation Medical Revolving Loan Fund. Established in 1952 by the Marshall Charitable Foundation of Tucson, Arizona for the purpose of providing loans to students enrolled in a pre-dental or pre-medical curriculum, and to graduates of Arizona State University in need of assistance in meeting the costs of medical school. Students will be expected to return to the State of Arizona and practice their professions for a period of not less than two years. Loans from this fund must be repaid within five years following graduation from medical school.

Marshall Foundation Student Aid Fund. Established in 1951 by the Marshall Foundation of Tucson, Arizona for loans to worthy and deserving students with financial need.

Nurse Training Act Loan Fund. This loan fund was established to make low-interest loans available to eligible students with clearly established financial need.

An eligible applicant is a student who is enrolled or has been accepted for enrollment in the College of Nursing as a full-time student (12 credits) to pursue a course of study leading to a baccalaureate degree in nursing, is a national of the United States or is in the United States for other than a temporary purpose and intends to become a permanent resident thereof, has filed an application for a loan from the fund, and is in need of the amount thereof to pursue a full-time course of study.

Preference shall be given to persons who enter the College of Nursing as first-year students and preference shall continue to be given to such persons during their entire period of eligible attendance in the College of Nursing. Loans may, however, be made to other students when such a loan is necessary to enable an eligible student to continue or complete her course of study. Persons entering as first-year students shall have given evidence in high school of the ability to make satisfactory academic progress, shall have given evidence on college entrance examinations of the ability to maintain satisfactory academic progress, and shall have a recommendation from the Dean, College of Nursing.

Students already in attendance in the College of Nursing shall have given evidence of making normal and satisfactory academic progress (grade index of 2.0 or higher), and shall have a recommendation from the Dean, College of Nursing.

Persons entering with advanced standing shall have given evidence on college entrance examinations of the ability to maintain satisfactory academic progress, and shall have a recommendation from the Dean, College of Nursing.

The amount of the individual student loan is not to exceed the total cost of tuition, books and residence fees, or the equivalent of residence fees if the applicant resides off campus. The loan shall be repayable in equal or graduated periodic installments over a ten-year period which begins one year after the student ceases to pursue a full-time course of study in the College of Nursing. Up to 50 per cent of any such load (plus interest) shall be cancelled for full-time employment as a professional nurse (including teaching in any of the fields of nurse training and service as an administrator, supervisor, or consultant in any of the fields of nursing) in any public or nonprofit private insitution or agency, at the rate of 10 per cent of the amount of such loan plus interest thereon, which was unpaid on the first day of such service, for each complete year of such service. Interest shall not accrue on any such loan, and periodic installments need not be paid, during any period during which the borrower is pursuing a full-time course of study leading to a degree in nursing.

Phoenix Welfare Foundation Student Loan Fund. Established in 1964 to aid worthy students attending Arizona State University who are bonafide residents of Maricopa County.

President's Student Aid Fund. Established in 1948 as a gift by former Arizona State University President, Dr. Grady Gammage, for loans to worthy students who by their demonstrated intellectual ability, character and financial need deserve assistance to enable them to continue their studies. Mrs. Marian P. Myers of Tempe, Arizona, has also contributed to the fund.

Rosenzweig Loan Fund. Established in 1955 by Newton Rosenzweig of Phoenix, Arizona for the purpose of aiding worthy and needy students with preference for those who are preparing themselves for a teaching career. Students must have sophomore standing or above with grades and activities which reflect a seriousness of purpose.

Tempe Kiwanis Circle K Loan Fund. Established in 1962 by the Tempe Kiwanis Club to aid and assist worthy and needy male students.

Tempe Rotary Loan Fund. Established in 1955 by the Tempe Rotary Club for use of worthy students with financial need, preference to be made to students who are residents of Tempe, Arizona.

Tempe Woman's Club Loan Fund. A revolving loan fund established in 1962 by the Tempe Woman's Club for the purpose of aiding worthy and needy students whose grades and activities indicate a seriousness of purpose.

The Irma Wilson Loan Fund. Established in 1965 by friends, students and colleagues of Dr. Irma Wilson, on the occasion of her retirement after 42 years of service to the University, to aid students who are majoring or minoring in Foreign Languages. Loans will be restricted in amount and time to short-term emergency needs so that a maximum number of students may be accommodated.

Charles and Ruby Tucker Woolf Scholarship Loan Fund. Established in 1962 by members and friends of the Woolf family, in memory of Charles and Ruby Tucker Woolf, who graduated from the Territorial Normal School in Tempe in 1893 and 1899 respectively, and always held the school as one of their major interests. Loans from this fund are available to junior, senior and graduate students in any field of interest in variable amounts subject to evidence of effective academic performance, character, and financial need.

United Student Aid Fund. This is a private, non-profit service corporation which endorses low-cost long-term loans made through various banks throughout the country. The participation of Arizona State University in this loan program has been made possible through the contributions and efforts of Mr. and Mrs. Adam Schantz of Tucson, Arizona; Mr. Paul Stansbury, Vice President representing the Valley National Bank; Mr. Eugene C. Pulliam, publisher, and Mr. Harry Montgomery, assistant publisher, representing the *Arizona Republic* and *Phoenix Gazette*; the Arizona State University Alumni Development Fund; Mr. Newton Rosenzweig of Phoenix, Arizona; and Mr. William C. Davidson and Mr. Jerry Lewis of Paramount Pictures. In Arizona, the First National Bank, the Valley National Bank, and the Arizona Bank participate in making these loans available to needy and worthy college students attending Arizona State University. A student to be eligible must enroll in a full course of study, substantiate financial need and have a minimum grade average of 2.0 (C).

Freshmen are eligible if they graduate in the upper 25% of their graduating high school class. Terms of this fund specify that the amount of the loan may not exceed $1,000.00 in any one academic year, or a total of $3,000.00 over a four-year period. Repayments begin the fourth month following graduation and are spread over thirty-six monthly installments. The interest is 6% simple interest, and starts from the day funds are disbursed to the student. Parents are not required to co-sign the notes but they are required to sign a statement indicating their knowledge of the loan. No collateral is needed. Students interested in this loan must arrange for an interview with the Director of Financial Aids.

National Defense Student Loan Fund. This loan fund was established by the Federal Government in agreement with Arizona State University to make low-interest loans available to eligible superior students with clearly established financial need. Applicants must be United States nationals (citizens and permanent resident status), and must be in good standing, making normal progress toward a degree. Inasmuch as the NDEA funds are limited, selections are made on the basis of many factors. Of utmost consideration are the following:

1. An entering freshman must be ranked in the upper 25% of his high school graduating class. Other students must maintain at least average grades.

2. The Act suggests that special consideration be given to: (1) students with a superior academic background who express a desire to teach, (2) students whose academic background indicates a superior capacity or preparation in science, mathematics, engineering, or a modern foreign language.

3. Financial need must be clearly established. Resources of both the applicant and his family must be evaluated. A statement of the parents' financial position will be required.

4. Applications will be available only after admission has been established. Forms for the NDEA loan program will be available after November 1 and must be returned completed to the Director of Financial Aids prior to June 1. Prospective freshmen and transfer applicants are urged to secure admissions clearance as early as possible.

Terms of the National Defense Education Act specify:

1. The amount loaned shall be for no more than is actually required, with the maximum of $1,000.00 in any one academic year and a total maximum of $5,000.00 for undergraduates.

Graduate students may borrow up to $2,500 per year with a maximum of $10,000.00 Graduate and undergraduate students working toward a degree and attending the University on a half-time basis are also eligible for financial assistance through this program.

2. Interest at 3% is charged beginning one year from the date when the borrower ceases to be a student, and repayment of principal and interest may be extended over a ten-year period from that date.

3. A borrower who teaches full time in elementary or secondary schools or colleges is eligible for partial cancellation of the loan for each academic year of service (10% for each year of teaching with a maximum of 5 years, or 50%).

Deadline dates: Loans to cover first semester only or the entire academic year (including summer school): June 1. Loans to cover second semester only and/or summer school: January 15.

Other Loan Programs. Financial aid for students comes from many other sources. These funds are not administered by the University. Examples of this type of aid are found in insurance company loans, foundation loans, banks, fraternal organizations, service clubs, and others. For more detailed information, consult your high school counselor or the Director of Financial Aids at Arizona State University, or inquire directly to the lending institution itself.

HONORS AND AWARDS

Academic Vice President's Award. A decoration is presented to the Army Company Commander and the Air Force ROTC Squadron Commander winning the Company and Squadron drill competition.

Air Force Association Medal. A decoration is awarded by the Air Force Association to the outstanding advanced course cadet who has successfully completed Summer Training Encampment.

Air National Guard Award. A trophy is presented by the Arizona Assistant Adjutant General for Air National Guard to the outstanding Air Force ROTC Cadet who has been accepted for flight training, has excelled in the Civil Aeronautics examination, has received a private flying license, has been recommended by his flight training instructor, has displayed the highest academic proficiency in his AFROTC courses, and who is a resident of Arizona.

Alpha Pi Epsilon Secretarial Award. An award given in the Office Administration and Business Education Department to the outstanding student of the year in secretarial courses.

American Association of University Women Awards, Arizona State Division. A national and a state membership in A.A.U.W. is awarded to two outstanding graduating senior women.

American Association of University Women Awards, Tempe Branch. The Tempe Branch of the American Association of University Women usually grants an award of $100 to an outstanding woman student who has a record of high scholastic achievement.

American Institute of Architects Awards. Awards are made annually by the Central Arizona Chapter, American Institute of Architects, to the students achieving the highest standard in architectural design.

American Institute of Electrical Engineers Prize Paper Awards. Cash prizes are awarded by the Arizona Section of the American Institute of Electrical Engineers for the best papers on subjects in electrical engineering and related fields.

American Legion Medal. A medal is awarded by William A. Bloys Post Number 2, American Legion, to the two cadets of the second year basic course, Army and Air Force ROTC, displaying the highest academic proficiency and capacity for military leadership in their respective departments.

Arizona Historical Foundation Award. A cash award of $100 and a bronze plaque emblematic of the joint contribution of the Indian, Spanish, Mexican and Anglo-American cultures of Arizona, given to a graduating senior in history who has shown outstanding aptitude in Arizona and Southwestern history.

Arizona National Guard Award. A trophy is awarded to the outstandng ROTC cadet who is a member of the Arizona National Guard.

Arizona Society of Certified Public Accountants' Award. Made to a senior graduating with the B.S. degree with a field of specialization in accounting. Based on scholarship and contributions to business.

Arizona State University Streamer. A decoration is presented by the Military Science and Air Science Departments to the guidon of the best-drilled Company, Army ROTC, and guidon of the best-drilled Squadron, Air Force ROTC.

Armed Forces Communication and Electronic Association Award. A medal awarded to the outstanding senior AFROTC cadet majoring in electrical or electronic engineering.

Arnold Air Society Award. Presented to the AFROTC cadet of the second year advanced course making the most outstanding contribution to Arnold Air Society and the Cadet Corps.

Art Purchase Prizes and Awards. Cash purchase prizes totaling $400 are awarded at the annual Art Exhibition for students and alumni of the Arizona State University Art Department in connection with the campus Art Festival. Prizes are offered in four classifications: oil painting, watercolor, ceramics and sculpture, and graphic and commercial arts. Both regular session and summer session students and alumni are eligible to exhibit. All awards are officially listed on the records of individuals registered with the Arizona State University Placement Center.

Associated Men Students' Academic Achievement Award. This award is presented each year to the male student graduating with the highest cumulative index.

Associated Men Students' Award. An award presented by the A.M.S. Council to a senior member of the Associated Men Students in recognition of outstanding service to the University.

Associated Women Students' Recognition Award. The A.W.S. Recognition Award is presented each year to a graduating senior woman who is considered the outstanding woman in her class. She is judged on the basis of leadership, personality, scholarship, and service to the University. Recommendations are received from administrators, faculty, and student organizations.

Association for Childhood Education, Student Branch Award. Recognition of an Elementary Education member for outstanding service to the organization.

Association of the United States Army Medal. A medal is presented to the member of the first year advanced course, Army ROTC, who is outstanding as a student, cadet, and leader.

Albert P. Ball Memorial Award. An award of $100 is given annually by Dr. Rachel S. Ball and members of the Department of Psychology to a student for the best essay on a problem of social significance.

Bandsman's Award. A decoration is presented by the Division of Special Services, Arizona State University, to the outstanding member of the combined Army-Air Force ROTC Band.

M. O. Best B Hall Award. M. O. Best B Hall bestows the Antypas Award upon its outstanding resident each semester. The award is named in honor of John Antypas, first president of the hall, who did much to organize the hall council and establish the traditions of the dormitory. In making the award, service to the hall, scholarship, and citizenship are taken into consideration. The name of each recipient is engraved on a plaque which is displayed in the M. O. Best B lobby.

Beta Chi Award. An award is given to the graduating senior chosen for her good scholarship, her contribution to the Home Economics Club, to the Home Economics Department, and to the University, and her promise of future development.

Burke Award. An award of $25.00 is given by Attorney and Mrs. William Burke to a graduating senior in the Home Economics Department who is outstanding in the field of Nursery School education.

Chemical Rubber Publishing Company Award in Chemistry and Physics. The Chemical Rubber Publishing Company annually awards a copy of their Handbook of Chemistry and Physics to the freshman student in general chemistry and to the beginning physics major with the most outstanding performance during the first semester.

Chicago Tribune ROTC Awards. A gold and silver medal is awarded by the Chicago Tribune Publishing Company to two Air Force and two Army ROTC cadets of the advanced course who have demonstrated military achievement, scholastic attainment, and character during the fall and spring semesters.

Chi Omega Social Science Award. The Chi Omega Social Science Award of $25.00 is given to the outstanding woman student in the field of Social Sciences. It is judged on scholarship and general ability in that field. The recipient is chosen by a committee of professors in the Department of Sociology and Anthropology.

Charles Christopher Memorial Award. This award, a replica of the trophy given posthumously to Charles Christopher, is given annually by the William H. Patterson BPOE of W Lodge No. 477, Phoenix, to the freshman judged most outstanding in athletic ability, scholarship, and general desirable personal qualities.

Commandants' Award. A decoration is presented by the Departments of Military Science and Air Science to the members of the Army or Air Force Rifle Team compiling the highest average score over the current academic year during formal postal and shoulder-to-shoulder competitive firing, using small-bore weapons.

Thomas J. Croaff Award. An award of $50.00 is given annually by Mrs. Carolyn B. Croaff in memory of her husband, Judge Thomas J. Croaff, to an undergraduate student for a research paper on juvenile delinquency or community problems.

Dean of the College of Liberal Arts Award. A decoration is presented by the Dean of the College of Liberal Arts to the two cadet commanders, Army and Air Force, winning the annual platoon-flight drill competition within their respective departments.

Dean of Students ROTC Award. A decoration presented to the outstanding Army and Air Force ROTC cadets who have provided the most valuable leadership in University student government activities during the preceding two years.

Delta Sigma Pi Scholarship Key. To encourage high scholarship, Delta Sigma Pi presents annually the Delta Sigma Pi Scholarship Key to the graduating senior who ranks highest in scholarship for the entire course in Business Administration.

Freshman Art Award. An award given to a freshman majoring in art. Selection determined on basis of scholarship, as well as art accomplishments and promise as an artist.

Bob Gehres Award. An award given each year by Blue Key to the most valuable baseball player in honor of Bob Gehres, an outstanding ASU pitcher, who died in 1950.

General Dynamics Award. A model aircraft is awarded by the General Dynamics Corporation to the outstanding second-year basic cadet who has been accepted for the advanced program.

Governor's Medal. A decoration is presented by the Governor of the State of Arizona to the respective cadet commanders of the Army and Air Force Corps of Cadets.

Graduating Honors. The honor, "With Distinction," is given to those whose index of scholarship, for all work taken at the University, is from 3.00 to 3.49 points. "With High Distinction" is given those whose index is from 3.50 to 4.00.

Hayden Hall Award. An award to a resident of Hayden Hall for outstanding achievement in service to the hall, scholarship, and service to the University.

Hillel Honor Awards. The Hillel Honor Awards are given to students of the Jewish faith who, by their devotion to service and consecration to duty, have made Hillel a worthwhile student organization.

Home Economics Senior Award. An award is given to the senior home economics major selected by the staff on the basis of outstanding accomplishments and promise of future contribution to the field.

Home Economics Sophomore Award. An award is given to the sophomore home economics major having the highest cumulative scholastic record during her first three semesters of college.

Interfraternity Council Scholarship Award. Each semester the Interfraternity Council awards scholarship trophies to: (a) the fraternity with the highest scholarship for its total membership, (b) the fraternity showing the most improvement over the previous semester's performance (combined actives and pledges).

Interhall Council Awards. The Interhall Council awards the scholarship trophy to the men's residence hall for the highest grade index for the first semester of each year. The Interhall Council also awards an intramural trophy to the outstanding hall in intramural activities.

Kappa Delta Pi Award. An award of $50.00 is made to the student in the College of Education having the highest cumulative index for all courses taken in the freshman and sophomore years at Arizona State University. The minimum number of hours is sixty.

Kappa Delta Pi Scholarship Key. This award is given to the graduating senior who has registered four years in the College of Education at Arizona State University, and has the highest cumulative scholarship index.

Kappa Kappa Psi Award. Beta Omicron Chapter of Kappa Kappa Psi presents an award to the most outstanding senior of the University Band.

La Liga Panamericana Award. An award given to a graduating senior for all around service to the club, and for high proficiency in oral Spanish.

Letter "A" Awards. A Letter "A" is awarded by the Athletic Department, Arizona State University, to the lettermen of the Army ROTC and Air Force ROTC Rifle Team.

Man of Music Award. An annual trophy is presented by Kappa Nu Chapter of the Phi Mu Alpha fraternity to the man who has contributed the most to the advancement and growth of the fraternity.

McGrew Printing Journalism Award. An award to an outstanding journalism student.

Moeur Award. This award of $50.00 is given by Sidney B. and Annie Laurie Lassator Moeur, both graduates of the class of 1914, to the graduate of any four-year curriculum who attains the highest standing in academic work during the four years immediately preceding graduation.

Ralph H. Morris Instrumental Music Award. An award of $100.00 is given by Mary Scott Morris, in memory of her father Ralph H. Morris, to a junior student of exceptional talent in instrumental music.

Music Department Award. An award is presented by the Music Department, Arizona State University, to the outstanding second-year basic member of the combined Army-Air Force ROTC Band.

Lewis S. Neeb Award. An award given to the senior industrial education major selected by the Division faculty in recognition of scholarship achievement, contributions to the University and to the Division, and promise of future growth.

John Henry Newman Award. Membership in National Honor Society for Newman Club members who give outstanding leadership in local club, province, and national organization; and so honor club patron, Cardinal Newman.

Newman Club Service Award. An award to a graduating senior woman who, by religious good example and four years of faithful service, has enhanced the spiritual goals of the Newman Club.

Panhellenic Scholarship Cup. A Panhellenic Scholarship Cup is awarded each year by the Phoenix Panhellenic Association to that sorority which has the highest scholastic average. Any sorority receiving the award for three consecutive years retains the cup permanently.

Panhellenic Scholarship Plaque. A Panhellenic Scholarship Plaque is awarded each year by the Panhellenic Council to the sorority having the highest scholastic average.

P.E.O. Award. Chapter X, Tempe, of P.E.O. awards $25.00 to a woman student of high ideals and outstanding service. Selection is based on integrity, intelligence, and aptitude.

Pershing Rifle Meritorious Award. An award presented by the Cadet Honorary Colonel to the Pershing Rifleman who has consistently contributed most to the furtherance of Pershing Rifle Co. D, 10th Reg. during the academic year.

Phi Eta Sigma Award. This award is given to the male student who attains the highest cumulative index for all courses taken in the freshman and sophomore years at Tempe.

Phi Kappa Phi Award. An award of $50.00 is given annually to the junior student with the highest scholastic index who is a member of Phi Kappa Phi.

Phi Upsilon Omicron Freshman Award. An award, based upon outstanding leadership, scholarship, and professional promise, is given to a freshman home economics major.

Pi Kappa Delta Awards. Awards are made annually by this national honorary forensic fraternity to students who achieve forensic proficiency.

Pi Omega Pi Award. Alpha Iota Chapter of Pi Omega Pi presents an award to the graduating senior selected as the most outstanding prospective business education teacher.

The Pleiades Plaque. Awarded by Pleiades to the women's hall having the highest collective undergraduate scholarship index. The group winning it three times in succession retains the plaque.

President's Award. A decoration is presented by the President of the University to the two outstanding cadets of the second year advanced course of their respective Cadet Corps.

Quadrangle Unit Award. Recognition of a resident of the Quadrangle Unit for outstanding achievement in scholarship and service to the Unit and to the University.

Charles William Rawlins Memorial Award. Tau Kappa Epsilon Fraternity presents a trophy to the outstanding intramural man within fraternities. This is in tribute to the late Bill Rawlins, a fine fraternity man and a fine athlete.

Religious Activities Awards. Two recognition awards are presented each year by the Student Religious Council to the man student and the woman student giving outstanding service in religious activities for the year. These awards are determined on the basis of (1) service to local university group and general church program, (2) service to total campus religious program, (3) personal religious living, and (4) other evidences of leadership.

Rosenzweig Trophy. This trophy is given annually by I. Rosenzweig & Sons to an outstanding letterman having the highest total point rating on athletic ability, general aptitude index, and scholarship index.

ROTC Award. An award presented by the Departments of Military Science and Air Science to the Army and Air Force ROTC Cadet making the greatest personal contribution to the Army and Air Force ROTC program at Arizona State University.

School of Nursing Achievement Award. An award presented by the School of Nursing faculty to a graduating senior for outstanding scholastic achievement.

H. Clay Skinner Memorial Award. A $50.00 award is presented annually by Mrs. H. Clay Skinner and Psi Chi to a senior psychology major who has attained the highest academic average among graduating physcology majors. The selection will be made by the officers and adviser of Psi Chi.

Sons of American Revolution Award. An award to the two cadets of the second year basic course, Army and Air Force ROTC, having the highest academic and military class standing and having rendered outstanding service to their respective departments and the University. Recommended by the PMS and PAS, chosen by the Arizona Society.

Student National Education Association Award. An award given by the Arizona State University Chapter of the Student National Education Association to the student or students who have rendered outstanding service to the Student NEA and the University.

Superior Cadet Ribbon Award. A Department of the Army award to one Army ROTC student in each academic class, chosen by a board of officers from the students in the upper fourth of his class in ROTC and academic standing. The award consists of a ribbon, certificate, and lapel device.

Glendon and Kathryn Swarthout Prizes in Creative Writing. Two first prizes of $50.00 each and two second prizes of $25.00 each awarded annually for the best undergraduate and graduate poetry and prose fiction.

Tau Beta Sigma Award. Sigma Chapter of Tau Beta Sigma presents an award to the most outstanding freshman of the University Band.

Tempe Daily News Journalism Award. An award is presented to a student doing outstanding journalism work.

Tyler Printing Company Award. An award presented annually to a student doing outstanding work in journalism.

Veterans of Foreign Wars Medal. A medal is presented by Bob Finch Post Number 3632, Veterans of Foreign Wars, to the two cadets of the first year basic course, Army and Air Force ROTC, exhibiting the highest academic proficiency and potentiality for military leadership in their respective departments.

Wall Street Journal Award. Dow Jones and Company presents a trophy and subscription to the *Wall Street Journal* to an outstanding senior in the College of Business Administration.

Weaver and Drover Prize for Architectural Design. An annual prize of $1,500 is awarded to the student or students submitting winning designs in the prize competition.

Women's Physical Education Award. An award given by the women's division of the Physical Education Department to a senior major for achievement in physical education.

ASSOCIATED STUDENTS

Every student registering for more than 6 hours is automatically a member of the Associated Students of Arizona State University. The Board of Regents, the President and the faculty challenge every student to accept his individual responsibility by exerting intelligent effort for self-government and for promoting the intellectual, moral, and social welfare of all students in a truly democratic manner. (See revised and complete Statutes.)

In terms of organization and procedure, these objectives may best be accomplished by patterning student government after the state and national government. This form, we believe, allows for protection, flexibility, and dynamic growth of student responsibility in higher education.

The Student Senate or Legislative Branch passes the laws governing ASASU, its boards and agencies. The Executive Branch carries out these laws, and the Student Court or Judicial Branch passes on the constitutionality of laws and interprets the Constitution.

Under authority delegated by the President of the University, Associated Women Students sets and enforces social standards and regulations regarding campus dress, coordinates women's student government through residence hall councils and the off-campus women's organization, establishes hours for women students, and formulates and administers policies deemed essential to promote a desirable group living experience.

ACTIVITIES AND ORGANIZATIONS

Student Activities Program. The University calendar includes many and varied programs and functions held on the campus and elsewhere. These include athletic events; social events including dances, banquets and teas; concert and lecture series; and dramatic presentations of many kinds. Both men's and women's residence halls play an important part in carrying out the activity program with the advice of carefully selected personnel officers and faculty members. (See Student Handbook.)

Student Organizations. According to his individual interest and available time, any student may choose those activities which satisfy his needs for congenial companionship, group security, recognition and creative effort. (See Organizations Directory.)

Official Approval. Information regarding approval of organizations may be obtained from the office of the Dean of Students, Room 103, Administration Building. Official approval of organizations may be withdrawn at any time the organization fails to comply with rules and regulations of Associated Students. At least once each year organizations are requested to submit the names of officers and other basic information. All approved organizations must have a copy of their constitution on file in the Office of Dean of Students. Organizations which do not meet these minimum requirements are removed from the official list which appears in the University catalog.

Scholastic Requirements. In order to be eligible for admission to membership in any student organization, a student must have a scholarship index of 2.00 or better in all courses carried for the semester immediately preceding. Any member of such an organization whose semester report shows a scholarship index of less than 2.00 may be suspended from active work in the organization for one semester.

COUNCILS

For Men

Interfraternity Council (See Sororities and Fraternities)
Men's Interhall Council (See Hall Councils)

For Women

Junior Panhellenic Council (See Sororities and Fraternities)
Panhellenic Council (See Sororities and Fraternities)

For Both Men and Women

Business Administration Student Council
College of Education Academic Council
Joint Council of Engineering Societies
Student Religious Council (See Religious Groups)

HONORARY GROUPS

For Men

Alpha Delta Sigma (National advertising honorary fraternity)
Archons (The) (Fraternity leadership and service)
Arizona Beta Chapter of Alpha Zeta (Agricultural fraternity)
Arnold Air Society (National honorary Air Force fraternity for advanced cadets)
Beta of Arizona Chapter of Tau Beta Pi Association (Engineering honor society)
Blue Key (National honorary service)
Kappa Kappa Psi National Band Honorary Fraternity

National Society of Pershing Rifles (National professional honorary for ROTC cadets)
Phi Eta Sigma (National scholastic honorary for freshmen men)
Phi Mu Alpha Sinfonia
Sigma Delta Psi (Honorary athletics)
Sigma Gamma Epsilon—Beta Chi Chapter (Earth science)
Silver Wing (Organization of the Air Force Reserve Officers Training Corps)
Sophos (Sophomore men's service)

For Women

Alpha Lambda Delta (National scholastic honorary for freshmen women)
Angel Flight of Arizona State University (Auxiliary to the Squadron of the Arnold Air Society)
Arizona State University Spurs (Honorary service organization)
Kaydettes (Sponsors for the Army Reserve Officers Training Corps)
Mortar Board (Senior women's honorary)
Naiads (Swim honorary)
Natani (Junior women's honorary)
Phi Upsilon Omicron (Home economics)
Pom Pon Girls
Sigma Alpha Iota (Women's national music fraternity)
Tau Beta Sigma (National band sorority)
Women's "A" Club (Honorary association in sports)

For Both Men and Women

Alpha Epsilon Delta (National pre-medical honorary)
Alpha Kappa Delta (Sociology)
Alpha Mu Gamma (Foreign language)
Alpha Pi Epsilon (National secretarial honor organization)
Alpha Pi Mu (Industrial engineering honor society)
Arizona State University Chapter of the Honor Society of Phi Kappa Phi (National honorary scholastic society)
Beta Alpha Psi-Beta Tau Chapter (Accounting honorary fraternity)
Beta Beta Beta, Tau Epsilon (National biology honorary)
Beta Gamma Sigma (National honor society for junior and senior students in the College of Business Administration)
Eta Kappa Nu-Epsilon Beta Chapter (National electrical honor society)
Kappa Delta Pi (National honor society in education)
National Collegiate Players (Drama)
Omicron Delta Epsilon, Honor Society in Economics, Arizona Alpha Chapter
Orchesis (Dance honorary)
Phi Alpha Theta (National history honorary)
Pi Chapter of Sigma Iota Epsilon (Business management)
Pi Delta Epsilon (National journalism honorary)
Pi Kappa Delta (Forensic fraternity)
Pi Omega Pi, Alpha Iota Chapter (National business education honorary)
Pi Sigma Alpha (National political science honorary)
Sigma Tau Delta (Honorary English fraternity)

PROFESSIONAL GROUPS

For Men

American Society of Mechanical Engineers
Arizona State Chapter of the American Institute of Industrial Engineers

Gamma Omega Chapter of the International Fraternity of Delta Sigma Pi (The) (Business professional fraternity)
Phi Delta Kappa (Professional education fraternity)
Phi Epsilon Kappa-Alpha Phi (Men's physical education fraternity)
Pi Sigma Epsilon (National professional fraternity in marketing, sales management, and selling)
Sigma Delta Chi (National professional journalism fraternity)
Student Construction Society of America

For Women

Gamma Alpha Chi (National professional advertising fraternity for women)
Physical Education Majors and Minors Club
University Home Economics Club-Beta Chi Epsilon

For Both Men and Women

American Society of Tool and Manufacturing Engineers, Student Chapter
Arizona State University Student Chapter, American Institute of Architects
Arizona State University Student Nurse Association
Association for Childhood Education International
ASU Accounting Club
ASU Chapter of Council for Exceptional Children
Finance Club
Gamma Theta Upsilon-Theta Chapter (National honorary professional geographic fraternity)
Industrial Arts Club of Arizona State University
Institute of Electrical and Electronic Engineers (The)
Society for Advancement of Management
Society of Chemical Engineering Students
Student Affiliate of the American Chemical Society
Student Chapter, American Society of Civil Engineers
Student Group of the Society of Automotive Engineers
Student Marketing Club
Student National Education Association of Arizona State University

SPECIAL INTEREST GROUPS

For Men

Arizona State Soccer Club
Arizona State University DeMolay Club
Circle K. Club of Arizona State University (Service Club)

For Women

Little Sisters of Minerva (Auxiliary of Sigma Alpha Epsilon)
Memorial Union Hostesses
Par Busters (Women's golf)
Phrateres International (National off-campus women's group)
Racquet Club (Tennis)

For Both Men and Women

Anthropology Club
Arizona State University Judo Club
Arizona State University Karate Club
Arizona State University Players (The) (Drama)
Arizona State University Young Democrats
ASU Chapter of Young Americans for Freedom (The) (Young conservatives)
ASU Forum (Discussion and debate)
ASU Pre-Law Club
ASU Young Republicans
Choral Union and Concert Choir
Dawa-Chindi American Indian Club

Devils 'n' Dames (Square dance)
Feather Dusters (Badminton)
Foreign Student Club
La Liga Panamericana (Promotes friendly relations among those interested in things Spanish)
Mathematics Club of Arizona State University
Oriental Students Club
Philosophy Club of Arizona State University (The)
Russian Club
Sun Devil Archers
Sun Devil Band
Sun Devil Flying Club
Sun Devil Rodeo Association
University Vagabonds Club
Women's Athletic Association

RELIGIOUS GROUPS

Student Religious Council. Composed of representative students from all denominations. Promotes religious programs, and fosters religious living.

For Men

Lambda Delta Sigma—Phi Alpha Chapter (L.D.S.)

For Women

Lambda Delta Sigma—Phi Omega and Phi Psi Chapters (L.D.S.)

For Both Men and Women

American Baptist Student Movement
Baha'i Club
Baptist Student Union
Campus Crusade for Christ (Non-denominational)
Canterbury (Episcopalian)
Chi Alpha (First Assembly of God)
Christian Science College Organization
Church of God Collegiate Fellowship
Congregational Fellowship
Conservative Baptist Youth
Delta Phi Kappa Honorary Fraternity (L.D.S. returned missionaries)
Disciples Student Fellowship
Hillel Counsellorship (Jewish)
Liberal Religious Students (Unitarian)
Lutheran Students Association
Martin Luther Society
Newman Catholic Student Association
Orthodox Fellowship of Arizona State University
Wesley Foundation (Methodist)
Westminster Foundation (Presbyterian)

SORORITIES AND FRATERNITIES

Panhellenic Council. The Panhellenic Council is composed of representatives of each sorority with the Associate Dean of Students and/or a representative from her office as sponsors. Sponsors are members ex officio.

Junior Panhellenic Council. The Junior Panhellenic is composed of representatives from the pledge class of each sorority.

Sororities. The following national Greek letter sororities carry on the traditional objectives of each group:

Alpha Delta Pi
Alpha Epsilon Phi
Alpha Phi
Chi Omega
Delta Gamma
Gamma Phi Beta
Kappa Alpha Theta
Kappa Delta
Kappa Kappa Gamma
Sigma Sigma Sigma

Interfraternity Council. Composed of two elected representatives from each member fraternity and the Council's faculty adviser. The Interfraternity

Council is the liaison between individual fraternities and University administration.

Fraternities. The following national Greek letter societies carry on the traditional objectives of each group:

Alpha Epsilon Pi
Alpha Gamma Rho
Alpha Rho Chi
Alpha Tau Omega
Delta Chi
Delta Sigma Phi
Kappa Alpha Psi
Kappa Sigma
Lambda Chi Alpha
Phi Delta Theta
Phi Gamma Delta
Phi Kappa Psi
Phi Sigma Kappa
Pi Kappa Alpha
Sigma Alpha Epsilon
Sigma Chi
Sigma Nu
Sigma Phi Epsilon
Tau Kappa Epsilon
Theta Chi
Theta Delta Chi

Men's Interhall Council. Composed of representatives from all men's dormitories. The purpose of the Council is to coordinate the social and educational programs of dormitories, as well as serve as a general means of communications between dormitories.

GROUP ACTIVITIES

Musical Activities. Opportunities are offered to all university students to become members of the performing organizations maintained by the Music Department. College credit is given for regular work in the Symphony Orchestra, Bands, University Chorus, Concert Choir, Opera Workshop, Men's Glee Club, Women's Chorus, and in special instrumental and vocal ensembles. Participation in any of the above groups without credit is also permissible. Students in these organizations give local concerts, radio and TV performances, and regional and national tours.

Intercollegiate Athletics—Men. The University is a member of the Western Athletic Conference, and is represented in such sports as football, basketball, track and field, baseball, tennis, golf, wrestling, swimming and gymnastics. The purpose of the program of intercollegiate athletics at Arizona State University is to provide the following important educational experiences all of which the faculty and the institution believe are fundamental to the American way of life: (a) To train students in legitimate methods of good sportsmanship, in competition, and in the will to win. (b) To aid in character development which includes cooperation and teamwork, leadership qualities, group loyalty, clean living and right thinking. (c) To contribute to the development of institutional morale, loyalty, and school spirit. (d) To supply wholesome recreation for the participants and other students. (e) To serve as a laboratory for the professional courses of those interested in physical education and coaching as a career.

Intercollegiate Athletics—Women. All intercollegiate athletics for women are sponsored by the Women's Athletic Association with membership on teams open to all college women. This type of competition includes sportsdays with other colleges in the State. Telegraphic, sectional, national meets, and tournaments in tennis, golf, badminton, and archery are conducted. Competition is in only those sports activities offered in regular instructional class periods.

Intramurals—Men. The University has a well-rounded intramural sports program. The program is designed to serve the needs of all the men students at Arizona State University. The sports are geared to individual and team competition.

Intramural sports have met a necessary challenge in the area of school life since their inauguration in the school program. The yearly program includes many diversified activities with both individual and team sports covering a wide range of needs.

Included in the seventeen sports are: tennis, volleyball, horseshoes, basketball, track and field, cross-country, tag football, golf, bowling, wrestling, and recreational sports.

Intramurals—Women. The program of intramurals for women is sponsored by the Women's Athletic Association, a member of the National ARFCW, and includes both the restricted student and the physically normal student. The program for both groups includes only those sport and dance activities offered in instructional class periods. The activities are open to all women in the University and are broad enough in scope to meet the interest of all women students.

Recreational Facilities. In addition to the recreational facilities provided in the dormitories and the Memorial Union, there are two modern, heated swimming pools, a large, modern gymnasium which has an annex, tennis courts, a number of playing fields, and athletic and recreational equipment for student use.

Forensics. Arizona State University sponsors a debate squad which is associated with Pi Kappa Delta national forensic honorary. Each year the squad travels to a minimum of ten trophy tournaments sponsored by major universities throughout the United States. Participants engage in national competition in extemporaneous speaking, impromptu speaking, oral interpretation and oratory, as well as debate. Students may enroll for credit under SE 214 or participate in the forensics programing as an extracurricular activity.

Drama. All plays are produced by the University Players, a student organization operating under the supervision of the Speech and Drama Department. In their modern theater in the Lyceum Building and in the Gammage Auditorium, the Players present nine major productions during the regular school year, plus many student-directed short plays. All students are invited to participate in these activities. Outstanding upperclassmen are honored by membership in National Collegiate Players, the national honorary dramatic fraternity.

Radio and Television. The Bureau of Broadcasting provides students enrolled in Mass Communications classes with a working laboratory completely equipped with the finest professional radio facilities.

Students majoring in radio-television, and others interested in participating on an extra-curricular basis, assist in the operation of KAET, the University's educational television station.

STUDENT PUBLICATIONS

The State Press. Under the combined auspices of the Administration, the Department of Mass Communications, and the Associated Students, there is published throughout the year a university-owned, student-operated newspaper, the *State Press.* It is distributed to students on campus, student subscriptions being included in the activity fee. Staff work on the *State Press* serves as professional training for students enrolled in journalism courses.

Sahuaro. The University yearbook, *Sahuaro,* is student-edited and published. Art and photography students, future teachers planning to supervise high school publications, and others interested in a major student activity find *Sahuaro* work especially rewarding.

MEMORIAL UNION

The Memorial Union is a center of cultural, social and recreational life at Arizona State University. Facilities include a social lounge and a fine arts lounge. Informal receptions for famous guest artists are held in the latter, after evening performances. The lounges are also used for reflection and reading.

Bowling, billiards, table tennis and other games are available in the MU games rooms. A card room is also located there. Many personal services are available at the information desk, including thread and needle, pencil sharpener, band-aids and campus and student directories.

The first floor includes a cafeteria and the Devils' Den snack bar. The Corral, on the second floor, is another informal eating spot. The ballroom is converted into a banquet hall for many occasions and the Pagoda Room, across the hall, is used for individual or group dining.

The Cultural Affairs Committee, the Social Activities Committee, and the Faculty-Student Relations Committee of Associated Students plan programs for out-of-class entertainment and cultural enrichment. Committee work gives students an opportunity to assume initiative and responsibility in the development of policies and activities.

All freshman women are invited to join the Memorial Union Hostess Committee. Members of the group serve as official hostesses to many University events held in the Memorial Union, such as concerts, lectures, conferences and receptions.

The Memorial Union Board consists of students representing various areas of the University. It makes recommendations regarding the use of the building and seeks and receives student opinion.

COLLEGE OF LIBERAL ARTS

KARL H. DANNENFELDT, Ph.D., DEAN

PURPOSE

The College of Liberal Arts aims to give the student an opportunity to obtain a well-rounded liberal education. Life in a changing world calls for a broad training and an appreciative understanding of the varied elements in our own and other cultures. Today the peoples of various nationalities, languages, religions, and vocational interests intermingle in a human society increasingly interdependent and bound together by improved means of communication, transportation, trade, and governmental cooperation. Peaceful and effective living in such a world requires flexibility in personal equipment and ability to make quick and intelligent adjustments in the social as well as the physical environment.

The liberally educated person will have facility with his own, and preferably one or more other languages; he will possess an understanding of himself and a broad knowledge of his physical, biological, social, moral, and spiritual environment; he will be able to deal effectively with the problems of his day in the light of the most reliable and tested knowledge of his time; he will have an appreciative understanding of the fine arts and find enjoyment in them; he will be able to live and act in the home, the local community, the nation, and the international community as an informed, responsible, and understanding human being.

The degree requirements are so arranged as to acquaint the student with the main fields of human knowledge and, at the same time, to bring to light his special aptitudes and interests. Although emphasizing breadth of training, the curriculums permit such a degree of specialization as to prepare the student for work in a professional school, for graduate study, or for the duties of a vocation.

ORGANIZATION

The College of Liberal Arts is organized into the following departments of instruction:

- Aerospace Studies
- Anthropology
- Botany
- Chemistry
- English
- Foreign Languages
- Geography
- Geology
- Health, Physical Education and Recreation
- History
- Home Economics
- Mass Communications
- Mathematics
- Military Science
- Philosophy
- Physics
- Political Science
- Psychology
- Sociology
- Zoology

BACHELOR'S DEGREES

The College of Liberal Arts offers work leading to two bachelor's degrees: the Bachelor of Arts and the Bachelor of Science. In general, the distinction between the curriculums offered for these two degrees lies in the fact that for the Bachelor of Arts degree, emphasis is placed on a broader, humanistic program, whereas for the Bachelor of Science, greater emphasis is placed on a special field.

MASTER'S DEGREES

A graduate program consisting of a minimum of 30 semester hours of approved work in a special field of study leads to the degrees of Master of Arts, Master of Science, Master of Natural Sciences, and Master of Public Administration. For specific reference to these degrees, see Graduate College section of this catalog.

DOCTOR OF PHILOSOPHY

A graduate program consisting of three academic years of work beyond the bachelor's degree as prescribed by the Graduate Council leads to the Doctor of Philosophy degree. For specific reference to this degree, see Graduate College section of this catalog.

HONORS PROGRAM

The Honors Program in the College of Liberal Arts is intended for the outstandingly competent student whose interests and specific curriculum indicate that definite advantages may accrue from a program emphasizing individual study. For a general description of Honors work, see page 76 of this catalog.

In addition to the general program in Honors referred to above, the Liberal Arts Honors student may, with the approval of his adviser and the Chairman of the Honors Council, enroll in any undergraduate course in this College. Seniors may enroll in graduate courses with the approval of the Dean of the Graduate College.

When enrolled in the Liberal Arts Honors Program, the full-time student, with the approval of his adviser and the instructor involved, may attend without credit, any class in the College of Liberal Arts.

Honors majors are offered in Anthropology, Botany, Chemistry, Drama, Economics, English, Foreign Languages, Geology, History, Journalism, Mathematics, Music, Philosophy, Political Science, Psychology, Sociology, and Zoology. Other Honors majors may be offered with the approval of the Honors Council.

BACHELOR OF ARTS

The curriculum for the degree of Bachelor of Arts is designed to give the student a broad, general background in the principal fields of human knowledge and a reasonable amount of specialized training in a selected area. It is divided into three parts:

GENERAL EDUCATION REQUIREMENTS

The general education program consists of 40 semester hours of approved courses, to be selected by the adviser in consultation with the student from among those approved courses listed on pages 72-75 of this catalog. In category IV, Sciences and Mathematics, the student must take at least one course in a laboratory science.

MAJOR REQUIREMENTS

A major shall consist of 45 semester hours of credit. Not more than 30 semester hours may be in a single subject field and at least 15 must be in one or more different but related subject fields. The content of the major is determined by the adviser in consultation with the student under the rules and regulations of the department concerned. At least 18 semester hours must be in upper division courses.

For specific major requirements see statements under each department in the catalog section "Courses of Instruction."

Major	Department
Anthropology	Anthropology
Art	Art (College of Fine Arts)
Chemistry	Chemistry
Drama	Speech and Drama (College of F.A.)
Economics	Economics (College of Bus. Admin.)
English	English
French	Foreign Languages
Geography	Geography
Geology	Geology
German	Foreign Languages
History	History
Home Economics	Home Economics
Humanities	Interdepartmental
Journalism	Mass Communications
Mathematics	Mathematics
Music	Music (College of F.A.)
Philosophy	Philosophy
Political Science	Political Science
Psychology	Psychology
Radio-Television	Mass Communications
Russian	Foreign Languages
Sociology	Sociology
Spanish	Foreign Languages
Speech	Speech and Drama (College of F.A.)

ADDITIONAL DEGREE REQUIREMENTS

1. Knowledge in *one* foreign language equivalent to the level obtained through 16 hours of instruction in the elementary and intermediate courses on the college level. This requirement may be fulfilled in whole or in part through language instruction in secondary schools or by other means. If acquired in secondary school, two years of instruction in *one* foreign language will be considered the equivalent of one year of instruction on the college level. A student who desires to fulfill the entire requirement through four years of study in *one* foreign language in secondary schools, or in other non-collegiate institutions, must pass a proficiency examination given by the Department of Foreign Languages in satisfaction of the total requirement. Students who transfer from other colleges with less than two years of credit in a foreign language will be placed in a course at the next level above the work completed.
2. All candidates for graduation in the Bachelor of Arts degree curriculum are required to present at least 50 hours of upper division courses.
3. A cumulative scholarship index of 2.00 is required for graduation and no credit will be granted toward fulfilling major requirements in any upper division course in the student's major unless the grade in that course is at least a "C".
4. All students, except those who receive a grade of "B" or better in EN 102, or who were exempt from that course, or who passed EN 104, shall, before the end of their sophomore year, take and pass a written English Proficiency Examination. Failure to take

this examination at the proper time or failure to pass it will make them ineligible to take upper division courses. This ineligibility will continue until such time as they pass a subsequent examination.

5. At least 60 hours, *not including the major,* must be taken in the following areas:
   All courses in Anthropology, Art History, Biology, Botany, Drama, Economics, Educational Psychology, English, Entomology, Foreign Languages, History, Humanities, Mathematics, Microbiology, Philosophy, Physics, Political Science, Psychology, Social Foundations (Education), Sociology, and Zoology.
   In the following areas, all courses *except* those specifically listed may be counted toward the fulfillment of this requirement: Chemistry, all courses except CH 300; Geography, all courses except GE 211 and 341; Geology, all courses except GL 215, 319, and 460; Health Education, all courses except HE 461; Home Economics, all courses except HO 123, 142, 321, 341, 343, 422, 423, 431, 457, and 480; Journalism, all courses except MC 211, 212, 311, 313, 315, 320, 411, and 413; Music, all courses except those in Music Performance and MU 311, 312, 461, and 480; Speech, all courses except SE 214, 315, and 316.
   In the following areas, only those courses listed may be taken for credit for the fulfillment of this requirement: Architecture, AC 100, 301, 311, 312, 317, 413, 414; General Physical Sciences, PL 110, 121, 321, 361, 362, and 410; Physical Education, PE 280, 385 and 386.

BACHELOR OF SCIENCE

The curriculum for the degree of Bachelor of Science is designed to give the student a broad general background in the principal fields of human knowledge and an opportunity to specialize in one specific selected area of scientific endeavor. It is divided into three parts:

GENERAL EDUCATION REQUIREMENTS

The general education program consists of 40 semester hours of approved courses, to be selected by the adviser in consultation with the student from among those approved courses listed on pages 72-75 of this catalog. In category IV, Sciences and Mathematics, the student must take at least one course in each group (Physical Sciences, Life Sciences, and Mathematics), and one of these courses must be a laboratory science. The additional work in this category is a required part of the general education electives.

MAJOR REQUIREMENTS

A major shall consist of from 45 to 55 semester hours of credit. The content of the major is determined by the adviser in consultation with the student under the rules and regulations of the department concerned. At least 40 per cent of the major must be in upper division courses.

For specific major requirements see statements under each department in the catalog section "Courses of Instruction."

Major	Department
Biology	Botany; Zoology
Botany	Botany
Boys' Club Administration	Health, Physical Education and Recreation
Chemistry	Chemistry
Economics	Economics (College of Bus. Admin.)

Entomology	Zoology
Geography	Geography
Geology	Geology
Health Education	Health, Physical Education and Recreation
Home Economics	Home Economics
Journalism	Mass Communications
Mathematics	Mathematics
Medical Technology	Botany
Microbiology	Botany
Physical Education	Health, Physical Education and Recreation
Physics	Physics
Psychology	Psychology
Radio-Television	Mass Communications
Recreation	Health, Physical Education and Recreation
Sociology	Sociology
Wildlife Biology	Zoology
X-Ray Technology	Botany
Zoology	Zoology

ADDITIONAL DEGREE REQUIREMENTS

1. All candidates for graduation in the Bachelor of Science degree curriculum are required to present at least 50 hours of upper division courses.
2. A cumulative scholarship index of 2.00 is required for graduation and no credit will be granted toward fulfilling major requirements in any upper division course in the student's major unless the grade in that course is at least a "C".
3. All students, except those who receive a grade of "B" or better in EN 102, or who were exempt from that course, or who passed EN 104, shall, before the end of their sophomore year, take and pass a written English Proficiency Examination. Failure to take this examination at the proper time or failure to pass it will make them ineligible to take upper division courses. This ineligibility will continue until such time as they pass a subsequent examination.
4. At least 60 hours, *not including the major,* must be taken in the following areas:
   All courses in Anthropology, Art History, Biology, Botany, Drama, Economics, Educational Psychology, English, Entomology, Foreign Languages, History, Humanities, Mathematics, Microbiology, Philosophy, Physics, Political Science, Psychology, Social Foundations (Education), Sociology, and Zoology.
   In the following areas, all courses *except* those specifically listed may be counted toward the fulfillment of this requirement: Chemistry, all courses except CH 300; Geography, all courses except GE 211 and 341; Geology, all courses except GL 215, 319, and 460; Health Education, all courses except HE 461; Home Economics, all courses except HO 123, 142, 321, 341, 343, 422, 423, 431, 457, and 480; Journalism, all courses except MC 211, 212, 311, 313, 315, 320, 411, and 413; Music, all courses except those in Music Performance and MU 311, 312, 461, 465, and 480; Speech, all courses except SE 214, 315, and 316.

In the following areas, only those courses listed may be taken for credit for the fulfillment of this requirement: Architecture, AC 100, 301, 311, 312, 317, 413, 414; General Physical Sciences, PL 110, 121, 321, 361, 362, and 410; Physical Education, PE 280, 385, and 386.

SPECIAL PROGRAMS

AMERICAN STUDIES

The American experiment has inspired men and women for over three centuries. Founded on faith in the dignity of the individual, in the free and open society, the United States has produced a national culture unique in history.

A wider knowledge and keener appreciation of American history, literature, government, economics and culture generally, must be a vital part of every American's heritage. Furthermore, its constant re-evaluation, re-examination and development constitute a unique, interdisciplinary task, for which universities are especially suited. It is the purpose of the Center for American Studies at Arizona State University to undertake some of these tasks through regularly scheduled courses, and through lectures, seminars and discussions open to students and public.

A student majoring in History, English, or Political Science can shape a program of American Studies, with the assistance of his adviser, by choosing appropriate courses from the major and minor fields and supplementing them with electives from Art History, Architecture, Geography, Philosophy, Sociology, or Anthropology.

BILINGUAL SECRETARIAL PROGRAM

Offered jointly by the Department of Foreign Languages and the Department of Office Administration and Business Education, this program is designed for those students who wish to combine proficiency in a language with preparation in an occupational field.

Students in this program receive the Bachelor of Arts degree with a major in French, German, Russian, or Spanish. Courses should be selected to include the following electives in the Department of Office Administration and Business Education: OA 101, 113, 201, 214, 232, 312, 331, 344, 351; GB 431. Students with adequate backgrounds in typewriting and shorthand may be permitted to omit OA 101, 113, and 214. Total business requirements could thereby be reduced from 28 semester hours to a minimum of 19 semester hours.

FOREIGN SERVICE TRAINING PROGRAM

Training for the Foreign Service is designed to prepare the student for Department of State examinations for the position of Foreign Service Officer or Information Officer. In this era of specialization, this program is unique in that there are no specifically required courses. The Department of State is looking for the liberally trained generalist and not the narrow specialist.

The one mandatory requirement appears to be a good command of the English language. That is, good oral and written expression are absolutely essential. It is also advantageous, although not mandatory, for the potential Foreign Service Officer to have an effective reading and speaking knowledge of at least one modern foreign language. Although competition is keen, the Department of State reports that the number of students who pass is high, especially among graduate students.

For specific requirements for the Foreign Service Examinations, the interested student should consult with the Foreign Service Training Program adviser. Copies of recent examinations may be had by writing to the Department of State, Washington, D.C.; or from the Placement Office on campus.

In selecting a major, the student interested in the Foreign Service would do well to major in political science, history, or economics. Programs designed to satisfy certain individual desires such as majors in modern foreign languages with substantial work in political science and history or economics are also quite acceptable.

LATIN-AMERICAN AREA STUDIES

Arizona State University, in the hope of strengthening the State's position in Hispanic-American affairs, offers a program of studies designed to be of cultural and vocational value. Governmental departments and agencies, as well as innumerable private organizations, are constantly in need of persons trained in Latin-American affairs.

The program is intended primarily to acquaint American students with the culture and development of Latin America. The course of studies stresses a broad knowledge of Spanish, Latin-American literature, history, economics, geography, government, architecture, music, and art.

It is recommended that the student select a major in one of the social sciences, with minor areas in Spanish and geography, selected from within the curriculum leading to the degree of Bachelor of Arts.

MEDICAL TECHNOLOGY

This curriculum is designed to prepare students for a career in medical technology. Students who have completed 94 semester hours of college credit, with a minimum of 30 semester hours at Arizona State University, have a scholarship index of 2.00 or above, and have satisfied the general education requirements of the College of Liberal Arts for the degree of Bachelor of Science, may obtain the degree after completing a full year's work (not less than 32 semester hours) with an average grade of "C" or above at a hospital having a medical technology program approved by the American Society of Clinical Pathologists (A.S.C.P.), providing, before entering the hospital program, the student secures a statement in writing from the Dean of the College of Liberal Arts, giving senior-in-absentia privileges. At the end of his year in the hospital program, the student must have completed a total of 126 semester hours of college credit. Following completion of the hospital program, the student shall request that a transcript of credits and a statement recommending that the degree be granted be forwarded from the hospital school to the Registrar, Arizona State University.

NON-WESTERN STUDIES

In response to the growing importance of Non-Western studies, an interdisciplinary undergraduate program is offered in this area which is designed to prepare undergraduates for governmental or private employment or for admission to graduate programs at other institutions.

The student must fulfill the requirements in one of the participating departments (Anthropology, Art, Geography, History, Philosophy, Political Science), as well as the other degree requirements of the College of Liberal Arts. The student, in consultation with the Non-Western Studies adviser in his major, will take those courses in Non-Western Studies offered in his major field and will select related field courses in Non-Western Studies given by other departments.

Most graduate programs in Non-Western fields require for admission at least one year of the language in the field of specialization. To meet this requirement, the student who intends to pursue his studies at the graduate level should plan to spend at least one summer in intensive study of the language of the area, preferably prior to the senior year.

PRE-DENTAL, PRE-MEDICAL, AND PRE-OSTEOPATHY

While schools of medicine, osteopathy, and dentistry indicate in their catalogs that students may occasionally be admitted with only two or three years of pre-medical training, the competition for admittance is so great that few students can hope for admission unless they have completed the work for their bachelor's degree. In recent years the average scholarship index of successful applicants has been approximately 3.00.

The requirements for entrance into schools of medicine, dentistry, and osteopathy are similar. The following analysis of admission requirements to medical schools, prepared by the Association of American Medical Colleges, is *apropos*. "Medical schools differ in the specific subjects they require of their applicants. All medical schools require some college work in chemistry, biology, and with one exception, physics. More work is specified in chemistry than any other single subject. Courses in both general and, with one exception, organic chemistry are required by all of the medical schools; quantitative analysis is specified by roughly half, and qualitative analysis and physical chemistry are specified by less than a quarter of the schools. Half of the medical schools require that the total number of semester hours spent in these chemistry courses be 16 or more, while the comparable figure for both biology and physics is 8 semester hours. Required courses in biology, other than general biology and zoology, include comparative anatomy and embryology, specified by approximately a quarter of the schools; and anatomy, genetics, micro-technique, etc., listed by only one or two schools. Nineteen of the medical schools require one or more courses in mathematics. Calculus will undoubtedly become a prerequisite for those schools who emphasize and include biophysics in their curriculums. English is a general requirement of almost all of the schools, and about half of them specify some knowledge of a foreign language. Only 18 of the medical schools require any work in the social sciences, although most of the medical schools believe such work helps to round out the liberal arts background of applicants. The total semester hours of required courses in all fields varies from 27 specified by Cornell to 84 hours for Alabama."

Approximately 75 per cent of the professional schools of the United States require less than 40 semester hours in science and mathematics. While additional work in these fields may be taken, the professional schools generally suggest that the prospective student secure a broad, general education, postponing his professional training until he enrolls in a professional school.

The student should consult the pre-medical adviser and discuss with him the program of studies necessary to qualify for admission to the professional schools in which the student may desire to register. The student will major in a specific field and the pre-medical adviser will refer him to the adviser in his field. It is wise, however, for the student to keep in touch with the pre-medical adviser, regardless of his major field of study, in order to keep abreast of any changes in admission requirements in the professional schools in which he is interested.

Students who have completed 94 semester hours of college credit, with a minimum of 30 semester hours at Arizona State University, have a scholarship index of 2.00 or above, and have satisfied the general education and major requirements of the College of Liberal Arts for the degree of Bachelor of Arts (including foreign language requirement) or Bachelor of Science, may obtain the degree after completing a full year's work in an accredited school of medicine with an average grade of "C" or above, providing, before entering the school of medicine, the student secures a statement in writing from the Dean of the College of Liberal Arts giving senior-in-absentia privileges. At the end of his first year in medical school, the student must have completed a total of 126 semester hours of college credit and present a signed testimonial from the dean of the medical school to the Registrar at Arizona State University, which shall include a statement of courses taken, grades achieved, and a recommendation that the degree be granted. Upon recommendation of his major department, the student wishing senior-in-absentia privileges may request the Standards Committee to allow credit earned in certain courses during the first year of professional school to count toward major field hours presented for graduation. Students who contemplate such a program should consult with their major adviser for details.

PRE-LAW

The requirements for admission to law schools vary from a minimum of three years of pre-legal college work to a four-year program leading to a bachelor's degree. The pre-law student should obtain a copy of the catalog of the law school that he plans to attend and plan his course of study under the guidance of his adviser.

The Association of American Law Schools has indicated that pre-law education should provide the student with: (a) ability in the comprehension and expression of words; (b) the critical understanding of human institutions and values with which the law deals; (c) creative power in thinking. The Association does not recommend any particular courses or sequence of courses for pre-legal training.

The leading law schools prefer that their students shall have completed four years of college work before entrance. Students planning to enter law school requiring a bachelor's degree for entrance may register within any of the major fields in the arts and sciences curriculums, or in the Business Administration curriculum, paying due regard to the recommendations in the preceding paragraph. The student should check carefully in the catalog of the law school which he hopes to attend in order to determine the entrance requirements of that school.

A few law schools admit students upon completion of three years of college work. Under the guidance of the pre-law adviser, work may be taken without reference to the requirements of a degree, and the only degree obtained will be that in law at the end of three additional years at law school.

Students who have completed 94 semester hours of college credit, with a minimum of 30 semester hours at Arizona State University, have a scholarship index of 2.00 or above, and have satisfied the general education and major requirements of the College of Liberal Arts for the degree of Bachelor of Arts (including foreign language requirement) or Bachelor of Science, may obtain the degree after completing a full year's work in an accredited school of law with an average grade of "C" or above, providing, before entering the school of law, the student secures a statement in writing from the Dean of the College of Liberal Arts giving senior-in-absentia privileges. The student must, at the end of his first year in law school, have completed a total of 126 semester hours of college credit and present a signed testimonial from the dean of the law school to the Registrar at Arizona State University, which shall include a statement of courses taken, grades achieved, and a recommendation that the degree be granted.

Students planning a pre-law program which provides for a bachelor's degree should select a major field of specialization not later than the beginning of his sophomore year. The pre-law adviser will refer him to the adviser in the specific field chosen to see that he meets the requirements for the bachelor's degree at Arizona State University.

PRE-MINISTERIAL

Students preparing to enter a theological seminary for advanced training leading to a degree in theology, should secure the catalog of the institution which they hope to enter and be guided by its recommendations during their preliminary training. Since no required course of preliminary training is offered at Arizona State University, it is suggested that the student follow a curriculum leading to a degree of Bachelor of Arts in an area which is compatible with his interests and abilities.

PRE-OCCUPATIONAL, PRE-PHYSICAL THERAPY

Students desiring to specialize in one of these fields should major in physical education with a pre-occupational or pre-physical therapy emphasis. The student's adviser in the Department of Health, Physical Education, and Recreation will indicate the courses essential in the student's preparation to qualify for admission to the professional school.

Upon completion of the bachelor's degree within either of these programs, a student is qualified to enroll in the certificate program offered in approved schools of occupational or physical therapy. Customarily, an internship of from nine to 18 months is required beyond the certificate year to complete the student's training.

PRE-OPTOMETRY

The general requirements for entrance to most schools of optometry include a total of sixty (60) hours, grouped as follows: English composition, 6 hours; chemistry, 8-10 hours; biological sciences, 8-12 hours; psychology, 3-6 hours; the remaining hours to be chosen from the social sciences and humanities. The following courses taught at Arizona State University will meet the entrance requirements of most schools of optometry: EN 101, 102; MA 117, 118, 120; CH 113, 115; PY 112, 240; PE 101, 102; PH 111, 112; ZO 100; 14 hours selected from social sciences, humanities, human physiology, anatomy, and microbiology. It is strongly urged that a prospective optometry student obtain a catalog from the school he plans to enter and that he follow their specific courses as closely as possible.

PRE-PHARMACY

The usual minimum requirement for admission to a college of pharmacy is one year of pre-pharmacy training, the content of which is specified by the college of pharmacy. The pre-pharmacy student should obtain a copy of the catalog of the college of pharmacy that he plans to attend and work out his course of study under the guidance of his adviser.

PUBLIC SERVICE TRAINING PROGRAM

It is anticipated that persons applying for positions in the public service in non-technical fields will have a broad cultural education with an adequate knowledge of political science, psychology, history, English, sociology, and economics. Non-technical Civil Service examinations stress the breadth of knowledge of a liberally educated person, his ability to reason clearly, his ability to quickly and accurately grasp and understand detail, and his rapidity and accuracy of judgment. While no program of courses is endorsed by the Federal Civil Service Commission, a study of the examinations given indicate that course work in the fields listed above could be profitably taken as preparation for a career in the public service. The student should remember that high grades and outstanding accomplishments during his educational preparation are highly desirable indications of probable ability and are important factors in a Civil Service examination.

Students on the undergraduate level preparing for public service should enroll in the curriculum leading to the Bachelor of Arts degree, and major in political science with emphasis in public administration. Graduate students enrolling in the public administration program should apply under the curriculum leading to a Master of Public Administration degree.

A listing of recommended courses for the program may be obtained from the Public Service Training Program adviser.

In cooperation with state and local governmental units, a Bureau of Government Research in this and related programs is maintained.

X-RAY TECHNOLOGY

Medicine and industry share a need for the person who is well-trained to make radiographic examinations, coordinate technical procedures, assist radiologists with treatments, process X-ray films and do special research.

This curriculum is designed to prepare students for a career in X-ray technology. The program consists of approximately two and one-half years college study and 18 months of hospital training. Students who have completed 84 semester hours of college credit, with a minimum of 30 semester hours at Arizona State University, have a scholarship index of 2.00 or above, and have satisfied the general education requirements of the College of Liberal Arts for the Bachelor of Science degree, may obtain the degree after completing 18 months' work (not less than 48 semester hours) with an average grade of "C" or above at a hospital offering a program in X-ray technology approved by the Council on Medical Education and hospitals of the American Medical Association in collaboration with the Commission on Technical Affairs of the American College of Radiology. Before entering the hospital program, the student must secure a statement in writing from the Dean of the College of Liberal Arts, giving senior-in-absentia privileges. The student, at the end of his hospital program, must have completed a total of 132 semester hours of college credit. Following completion of the hospital program, the student shall request that a transcript of credits and a statement recommending that the degree be granted be forwarded from the hospital school to the Registrar, Arizona State University.

COLLEGE OF BUSINESS ADMINISTRATION

GLENN D. OVERMAN, D.B.A., DEAN

PURPOSE

The primary purpose of the College of Business Administration is to prepare students for positions of responsibility in the business community. The undergraduate and graduate degree curricula are designed to provide (1) a basic background of general education helpful to informed, thinking citizens in a democracy, (2) a mastery of basic business tools and skills and an understanding of business procedures, and (3) a specialized and professional knowledge of a selected field of business. In order to attain these objectives in the undergraduate program the curriculum has been devised so that the student completes 45% of his work in general education and other non-business courses and 45% in courses offered by the College of Business Administration, with the remaining 10% selected from either area by the student in consultation with his adviser.

The College is a member of the American Association of Collegiate Schools of Business, the official accrediting organization in the field of business administration. Both the undergraduate and graduate programs of the College of Business Administration are accredited by this association.

In addition to the regular degree curricula, other programs of study in the College of Business Administration are designed to meet special needs. Preparation for the teaching of business subjects in the secondary schools is offered in cooperation with the College of Education. A special secretarial program is offered for students who wish to prepare for office positions but who do not plan to spend four years in college. Evening and extension courses are conducted for qualified persons who are regularly employed and who would otherwise be unable to enroll in college courses. Short courses and institutes on a non-credit basis are organized in cooperation with various business groups for the furtherance of in-service training of employed personnel.

ORGANIZATION

The courses of instruction offered by the College of Business Administration are organized into groups in order that a related sequence may be established for the various subject fields. These subject fields include Accounting, Advertising, Economics, Finance, General Business Administration, Insurance, Management, Marketing, Office Administration, Real Estate, and Business Education.

For administrative purposes these fields are organized into the following departments:

Accounting
Economics
General Business Administration
Management
Marketing
Office Administration and Business Education

In addition to the regular instructional program, the College of Business Administration operates a Bureau of Business Research and Services which gathers and publishes business and economic data pertaining to the surrounding community. The Bureau serves as a laboratory for students in the College of Business Administration who wish to secure practical experience in business research and analysis.

DEGREES

BACHELOR OF SCIENCE

The College of Business Administration awards the Bachelor of Science Degree upon successful completion of a four-year curriculum of 126 semester hours as prescribed on the following pages. Students may select one of the following ten fields of specialization:

1. Accounting
2. Advertising
3. Economics
4. Finance
5. General Business Administration
6. Insurance
7. Management
8. Marketing
9. Office Administration
10. Real Estate

Students who wish to qualify to teach business subjects in high school should major in business education. Under this program, the student enrolls in the College of Education but specializes in business courses for his major teaching field. This curriculum leads to the Bachelor of Arts in Education Degree and certification for teaching business subjects in the Arizona secondary schools. The courses required in business for this curriculum are listed under the secondary curriculum section of the College of Education.

MASTER'S DEGREES

The Master of Business Administration Degree and Master of Science Degree in the fields of accounting and economics are awarded upon successful completion of programs detailed in the Graduate Catalog.

Master of Business Administration. The Master of Business Administration Degree is designed to meet the needs of students who seek a broad, integrated program in the various functional fields of business. The program of study emphasizes the managerial responsibility of policy formulation, problem solving and decision making. Students with undergraduate backgrounds in general education or engineering as well as those with bachelor's degrees in business administration will find the program well suited to their needs. Students without prior work in business administration must complete approximately two years of study while those with an undergraduate degree in Business Administration may complete requirements in one calendar year.

Master of Science in Accounting. The Master of Science in Accounting Degree provides a specialized program emphasizing preparation for public accounting and college and university teaching, with sufficient flexibility to include courses in managerial accounting, tax accounting, and governmental accounting, as well as in allied fields.

Master of Science in Economics. The Master of Science in Economics Degree is a specialized program for students who desire to teach in colleges and universities, to prepare for research positions, or to take additional graduate work in economics. The Master's program in economics requires graduate work in macro-economic analysis, micro-economic analysis, and quantitative methods. It is normally expected that the candidate for a Master of Science in Economics Degree will write a thesis.

DOCTOR'S DEGREES

Doctor of Business Administration. The program leading to the Doctor of Business Administration Degree provides the student with broad knowledge and understanding of business and its economic environment and competence in selected areas of specialization. In pursuing these objectives, the student must (1) develop a thorough understanding of the administrator's point of view; (2) demonstrate proficiency in the utilization of quantitative tools for research; and (3) complete a research project that makes a significant contribution to the knowledge and understanding of business administration.

BACHELOR OF SCIENCE IN BUSINESS ADMINISTRATION

Students seeking a Bachelor of Science Degree in the College of Business Administration must satisfactorily complete a curriculum of 126 semester hours as indicated below.

I.	General Education Courses and Other General Courses	57 sem. hrs.
II.	Business Administration Core Curriculum	33 sem. hrs.
III.	Field of Specialization	24 sem. hrs.
IV.	Electives	12 sem. hrs.
	Total	126 sem. hrs.

GENERAL EDUCATION REQUIREMENTS

For courses permitted under categories I to V, see General Education requirements (Pages 72-75).

Communications .... 8 sem. hrs.

All students in the College of Business Administration must complete either SE 100 Elements of Speech or SE 300 Principles and Methods of Discussion.

Humanities .... 8 sem. hrs.

Behavioral and Social Sciences .... 15 sem. hrs.

All students in the College of Business Administration must complete courses in four areas, including EC 201, 202, Principles of Economics, and a course in either psychology or sociology.

Sciences and Mathematics .... 8 sem hrs.

All students in the College of Business Administration must complete MA 116, Intermediate Algebra, or a higher level approved course in mathematics.

Physical Education and Health .... 1 sem. hr.

Other General Courses .... 17 sem. hrs.

Additional General Education courses or similar courses which provide breadth and cultural background must be selected in consultation with the student's adviser. Courses of a specialized, vocational, technical or professional nature may not be included in this group. Military or Air Science, required of all freshman and sophomore men, may be included.

Total General Education and General Courses .... 57 sem. hrs.

BUSINESS ADMINISTRATION CORE CURRICULUM

In order to obtain an understanding of fundamentals of business operation, and to develop a broad business background, every student seeking a Bachelor of Science degree in the College of Business Administration must complete the following courses:

GB	101	Introduction to Business	3
AC	101	Elementary Accounting	3
AC	102	Elementary Accounting	3
GB	161	Business Mathematics	3
GB	221	Business Statistics	3
GB	233	Business Communication	3
MK	300	Principles of Marketing	3
MG	301	Principles of Management	3
GB	305	Business Law	3
FI	325	Business Finance	3
MG	463	Business Policies	3
		Total	33 sem. hrs.

FIELD OF SPECIALIZATION REQUIREMENTS

A field of specialization consists of a pattern of 24 semester hours in related courses falling primarily within a given subject field. Fields of specialization are available in accounting, advertising, economics, finance, general business administration, insurance, management, marketing, office administration and real estate.

Accounting. Accounting is a fast-growing professional field. This field of specialization includes the essential academic training for: (1) those wishing to prepare themselves for professional careers in public accounting; (2) those seeking positions as controllers, heads of accounting divisions, cost accountants, or internal auditors; (3) those wishing to serve in any of the numerous accounting positions offered in federal, state, and local governments; and (4) those planning to operate their own businesses.

A field of specialization in accounting shall consist of a minimum of 24 semester hours. The following 18 hours must be included:

AC	201	Intermediate Accounting	3
AC	202	Intermediate Accounting	3
AC	331	Cost Accounting	3
AC	383	Advanced Accounting	3
AC	451	Federal and State Income Tax	3
AC	481	Auditing Theory and Practice	3

To complete the field of specialization the student, with the approval of his adviser, shall select 6 hours or more from the group below:

AC	322	Mathematics of Finance	2
AC	415	Financial Statement Analysis	3
AC	432	Advanced Cost Accounting	3
AC	447	Accounting Systems	3
AC	472	Consolidations and Mergers	3
GB	302	Electronic Data Processing	3
GB	306	Business Law	3
GB	402	Data Processor Programming	3
GB	407	Data Processing Systems	3
GB	431	Business Report Writing	3

Note: All accounting students must complete 1-MA 117, College Algebra, as a part of the General Education requirements in Sciences and Mathematics.

Advertising. Use of the mass communications media for conveying ideas and information to customers, employees, stockholders, and the general public is an essential part of modern business operation. This field of specialization offers students an opportunity to prepare for careers in advertising, public relations, and related activities dealing with mass communications. Employment opportunities include positions with advertising agencies, retail stores, manufacturing firms, newspapers, and broadcasting stations.

A field of specialization in advertising shall consist of a minimum of 24 semester hours. The following 19 hours must be included:

AD 301	Advertising Principles	3
AD 311	Advertising Campaigns I	2
AD 312	Advertising Campaigns II	2
AD 371	Radio and Television Advertising	3
AD 461	Advertising Management	3
MK 310	Principles of Selling	3
MK 483	Marketing Research	3

To complete the field of specialization the student, in consultation with his adviser, shall select 5 hours or more from the following group:

1-MC 110	Mass Communications	3
AD 453	Advertising Campaign Problems	2
MK 302	Marketing and the Firm	3
MK 305	Analytical Methods in Marketing	3
MK 321	Principles of Retailing	3
MK 401	Public Relations in Business	3
MK 411	Sales Management	3
MK 460	Marketing Policies	3

Economics. The study of economics affords an opportunity for the student to acquire a general knowledge of the operation of business and economic systems. This knowledge provides a sound basis for successful business ownership and control. Specialized courses are included to develop ability in the use of the tools of economic theory and analysis. Such tools are essential for graduates who wish to qualify for government or business positions requiring formal training in economics.

The field of specialization in economics shall consist of a minimum of 24 semester hours. The following 12 hours must be included:

EC 301	Money and Banking	3
EC 401	Intermediate Price Analysis	3
EC 402	Economics of Income and Employment	3
EC 441	History of Economic Thought	3

In addition the student shall select a minimum of 12 semester hours from the group below to complete the field of specialization:

EC 321	Labor Economics	3
EC 331	Comparative Economic Systems	3
EC 336	International Economics	3
EC 341	Public Finance	3
EC 408	Foundations of Econometrics	3
EC 412	Business Cycles	3
EC 451	Economics of Public Utilities	3
EC 453	Government and Business	3
EC 461	Current Economic Problems	3
FI 441	Investments	3
GB 341	Transportation	3
GB 422	Adv. Bus. and Econ. Stat.	3

Finance. Courses in finance are designed to provide students with an understanding of the financial operations of business enterprises, as well as knowledge of the fields of commercial banking, investments, and mercantile and retail credits. This field of specialization prepares students for careers in (1) commercial banks and related financial institutions, (2) investment banking and investment management, and (3) financial management, including careers as treasurers, controllers, credit managers, and financial administrators in business enterprises.

A field of specialization in finance shall consist of a minimum of 24 semester hours. The following 15 hours must be included:

FI	301	Money and Banking	3
FI	305	Credit Management	3
FI	441	Investments	3
FI	451	Bank Organization and Management	3
FI	461	Cases in Business Finance	3

To complete the field of specialization the student, in consultation with his adviser, shall select 9 hours or more from the group below:

AC	201	Intermediate Accounting	3
AC	202	Intermediate Accounting	3
AC	415	Financial Statement Analysis	3
AC	451	Federal and State Income Tax	3
EC	336	International Economics	3
EC	341	Public Finance	3
EC	402	Economics of Income and Employment	3
EC	412	Business Cycles	3
FI	440	Security Markets	3
GB	306	Business Law	3
IN	251	Principles of Insurance	3
RE	251	Real Estate Principles	3
RE	331	Real Estate Finance	3

General Business Administration. This field offers the opportunity for a broad survey of all phases of business operation. It is particularly suitable for (1) those students who are planning to operate their own businesses and seek a broad business background, (2) those who are preparing for jobs in large organizations with training programs in which specialization is taught after employment, and (3) those who desire a general business background at the undergraduate level prior to taking more specialized graduate work.

The objective of the curriculum in General Business Administration is to provide breadth of preparation rather than specialization. Sufficient flexibility is provided, however, to permit students to emphasize such professional fields as transportation, statistics or electronic data processing.

A minimum of 24 semester hours in economics and business administration is required with a maximum of 9 hours in one subject field. Four senior courses (numbered 400 or above) must be included. Twelve of the 24 hours must be selected from the following list of courses:

AC	415	Financial Statement Analysis	3
AD	301	Advertising Principles	3
EC	321	Labor Economics	3
EC	453	Government and Business	3
FI	305	Credit Management	3
GB	306	Business Law	3
GB	341	Transportation	3

GB	431	Business Report Writing	3
GB	451	Business Research Methods	3
IN	251	Principles of Insurance	3
MG	311	Personnel Administration	3
MG	451	Human Relations in Business	3
MK	310	Principles of Selling	3
MK	401	Public Relations in Business	3
MK	460	Marketing Policies	3
OA	351	Principles of Office Management	3
RE	251	Real Estate Principles	3

Insurance. Academic preparation for professional work in insurance sales, insurance adjustment, and insurance management is offered through this program. A field of specialization in insurance shall consist of a minimum of 24 semester hours. The following 11 hours must be included:

IN	251	Principles of Insurance	3
IN	321	Life Insurance	3
IN	331	Property Insurance Principles and Coverages	3
IN	451	Social Insurance	2

To complete the field of specialization, 13 or more hours from the following:

IN	425	Current Problems in Insurance	2
IN	432	Property Insurance Administration	3
FI	301	Money and Banking	3
FI	441	Investments	3
GB	306	Business Law	3
MK	310	Principles of Selling	3
MK	411	Sales Management	3
RE	251	Real Estate Principles	3

Management. The management function includes the planning, organizing, motivating, and controlling of business operations. It deals with both human elements and material or physical factors. Through selection of courses, as outlined below, the student may place his major emphasis upon personnel management, production management, or the broad aspects of management philosophy and practice. A field of specialization in management shall consist of a minimum of 24 semester hours. The following 18 hours must be included:

MG	311	Personnel Administration	3
MG	331	Industrial Management	3
MG	335	Methods Management	3
MG	433	Managerial Decision Making	3
MG	434	Management Responsibility in Society	3
MG	451	Human Relations in Business	3

The remainder of the required courses shall be selected by the student in consultation with his adviser as follows:

Those students planning careers in industrial relations or personnel management shall select at least 6 semester hours from:

MG	413	Wage and Salary Management	3
MG	423	Industrial Relations and Collective Bargaining	3
EC	321	Labor Economics	3
IN	451	Social Insurance	2

Those students planning careers in industrial and production management shall select at least 6 semester hours from:

MG	338	Industrial Safety	2
MG	432	Materials Management	3
MG	491	Operations Research	3
AC	301	Management Uses of Accounting	3
AC	331	Cost Accounting	3
MK	355	Purchasing	3

Those students seeking preparation in the broad aspects of management philosophy and practice shall select at least 6 semester hours from:

MG	422	Employee Training and Supervision	2
MG	423	Industrial Relations and Collective Bargaining	3
MG	491	Operations Research	3
AC	301	Management Uses of Accounting	3
EC	453	Government and Business	3
MK	401	Public Relations in Business	3

Marketing. Study in the field of Marketing involves analysis of the ways business firms plan, organize, administer and control their resources to achieve marketing objectives. Focus is placed on market forces, growth and survival of firms in competitive markets, and the marketing strategy and tactics of the firm. Through proper selection of courses, a student may place emphasis upon preparation for a career in (1) general marketing administration, (2) selling and sales management, (3) retail merchandising and management, (4) purchasing and industrial procurement, or (5) foreign trade.

A field of specialization in marketing shall consist of a minimum of 24 semester hours. The following 12 hours must be included:

MK	302	Marketing and the Firm	3
MK	305	Analytical Methods in Marketing	3
MK	460	Marketing Policies	3
MK	483	Marketing Research	3

To complete the field of specialization, the student, with the approval of his adviser, shall select a minimum of 12 hours from the group below:

MK	310	Principles of Selling	3
MK	321	Principles of Retailing	3
MK	335	Foreign Trade	3
MK	355	Purchasing	3
MK	401	Public Relations	3
MK	411	Sales Management	3
MK	424	Retail Store Management	3
MK	434	Industrial Marketing	3
AD	301	Advertising Principles	3
EC	331	Comparative Economic Systems	3
EC	336	International Economics	3
EC	453	Government and Business	3
GB	322	Applied Business Statistics	3
GB	345	Industrial Traffic Management	3
GB	422	Advanced Business and Economic Statistics	3
MG	331	Industrial Management	3

Office Administration. The course work in this field is designed to prepare students for either secretarial or office management positions. Through the selection of courses, as outlined below, the student may place his major emphasis upon either of these fields.

A field of specialization in office administration shall consist of a minimum of 24 semester hours. The following 15 hours must be included:

OA	143	Business Machines	2
OA	201	Advanced Typewriting	3
OA	232	Records Systems and Filing	2
OA	344	Office Appliances	2
OA	351	Principles of Office Management	3
GB	301	Mechanized Data Processing	3

To complete the field of specialization the student, in consultation with his adviser, shall select the remainder of the 24-hour major requirement from the following courses:

For those planning careers in secretarial administration:

OA	214	Shorthand	3
OA	312	Transcription	4
OA	331	Secretarial Procedures	3
AC	201	Intermediate Accounting	3
GB	431	Business Report Writing	3
MG	311	Personnel Administration	3
MK	401	Public Relations in Business	3
1-SE	411	Business and Professional Speech	3

For those planning careers in office management:

AC	201	Intermediate Accounting	3
AC	202	Intermediate Accounting	3
GB	302	Electronic Data Processing	3
GB	431	Business Report Writing	3
MG	311	Personnel Administration	3
MG	422	Employee Training and Supervision	2
MG	451	Human Relations in Business	3

Real Estate. Courses in real estate are designed to acquaint students with the basic information, knowledge, and practices pertaining to real property and the real estate business. This field of specialization is the academic foundation for careers in various aspects of real estate work: sales, acquisition and development, taxation, management of property, title searching and legal work, appraisal, and finance.

A field of specialization in real estate shall consist of a minimum of 24 semester hours. The following 12 hours must be included:

RE	251	Real Estate Principles	3
RE	302	Real Estate Management	3
RE	331	Real Estate Finance	3
RE	411	Real Estate Law	3

To complete the field of specialization the student, in consultation with his adviser, shall select 12 hours or more from the following:

RE	401	Real Estate Appraisal	2
RE	441	Real Estate Land Development	3
RE	461	Real Estate Problems	3
AC	451	Federal and State Income Tax	3
AD	301	Advertising Principles	3
FI	441	Investments	3
GB	306	Business Law	3
IN	251	Principles of Insurance	3
MK	310	Principles of Selling	3

ELECTIVE COURSES

Sufficient elective courses are to be selected by the student to complete the total of 126 semester hours required for graduation.

HONORS PROGRAM

Students with outstanding academic records may be admitted to the Honors Program by application to the Honors Council of the College of Business Administration. This program provides an opportunity for students with exceptional ability to select an academic program to meet their individual needs. Although the general curriculum requirements must be completed, considerable opportunity is given for independent study under the direction of an Honors Adviser. A thesis or an equivalent creative project is required for graduation.

For further details regarding the Honors Program see the University Honors Program description on page 76 or consult the Office of the Dean of the College of Business Administration.

GENERAL REGULATIONS

Each student enrolling in the College of Business Administration will be assigned an adviser upon the basis of the subject-matter field in which he is primarily interested. The student should follow the sequence of courses suggested in the four-year curriculum outline and the recommendations of his adviser in completing the prescribed background and tool courses in preparation for the subsequent professional program.

All students in the College of Business Administration must attain a minimum cumulative grade point index of 1.60 at the end of the freshman year.

THE PROFESSIONAL PROGRAM

The third and fourth years constitute the professional program of the undergraduate curriculum. For admission to the professional program the student must have completed:

(1) at least 60 semester hours with a minimum cumulative grade point index of 2.00,

(2) all Business Administration core curriculum courses numbered below 300 and EC 201, 202, Principles of Economics, with a minimum cumulative grade point index of 2.00,

(3) at least 32 semester hours in general education and other cultural background courses.

Failure to meet the requirements for admission to the professional program may result in the student's becoming ineligible to enroll for 300 and 400 level courses in the College of Business Administration.

To be accepted for credit as part of the professional program in Business Administration, all courses transferred from other institutions must carry prerequisites similar to those of the courses which they are replacing at Arizona State University.

GRADUATION REQUIREMENTS

In addition to completion of the pattern of courses outlined on pages 136-137, to be eligible for the Bachelor of Science Degree in the College of

Business Administration a student must fulfill the following requirements:

(1) have completed at least 30 semester hours, including 24 in professional business courses (numbered 300 or above), *after* admission to the professional program,

(2) have attained a cumulative grade point index of 2.00 or better:
   (a) for all courses taken while a student at the University
   (b) for all courses included in the Business Administration core curriculum,
   (c) for all courses comprising his field of specialization.

(3) have accumulated a minimum of 51 semester hours in courses designed primarily for junior or senior students and completed in an accredited, 4-year degree-granting institution.

Any exceptions to the core curriculum and field of specialization requirements of the College of Business Administration must be approved by the Standards Committee.

SUGGESTED FOUR-YEAR CURRICULUM OUTLINE

FIRST YEAR

	Sem. Hrs.
GB 101	3
GB 161	3
1-EN 101, 102	6
1-MA 116 or other approved mathematics course	3
1-PE 101, 102	1
1-AS 101, 102 or 1-MS 101, 102	3
Behavioral and Social Sciences	6
Science or additional Mathematics	3 to 5
Electives	2 to 4
	32

SECOND YEAR

	Sem. Hrs.
AC 101, 102	6
EC 201, 202	6
GB 221	3
GB 233	3
1-SE 100 or 300	2
1-AS 201, 202 or 1-MS 201, 202	3
Humanities	8
	31

THIRD YEAR

	Sem. Hrs.
MK 300	3
MG 301	3
GB 305	3
FI 325	3
Field of Specialization and Electives	17
Behavioral and Social Sciences	3
	32

FOURTH YEAR

	Sem. Hrs.
MG 463	3
Field of Specialization and Electives	28
	31

Note: Students registering in the accounting field of specialization should enroll in AC 101 and AC 102 the first year, postponing science, mathematics or electives until later in the program. In some other fields of specialization, students should schedule beginning courses in their field during the sophomore year, postponing one of the general education courses until later. The student should consult his adviser for details of the course sequence in the field of specialization.

PRE-LAW CURRICULUM

Pre-law students may pursue a program of study in the College of Business Administration as well as in the College of Liberal Arts. Courses in accounting, economics, finance, insurance, labor relations, and statistics are recommended for any student planning to enter the legal profession.

The admission requirements of colleges of law differ considerably. The student should communicate with the dean of the law school he hopes to attend and plan his program to meet the requirements of that school. Many law schools require a baccalaureate degree for admission whereas others permit admission upon completion of three years of college work. Arizona State University cannot accept responsibility for the admission to law school of students following any pre-law program. A four-year and a three-year curriculum are offered for students wishing to complete their pre-law in one of the various fields of business. The four-year program affords a better business preparation for a career in law.

FOUR-YEAR CURRICULUM

Students who plan to take a bachelor's degree prior to entering law school may follow any of the standard curricula in the College of Business Administration. Regular advisers in each field will assist the student in selecting both required and elective courses which will be of particular value in the study of law.

THREE-YEAR CURRICULUM

A student may select a three-year program in the College of Business Administration and if, after completing 98 semester hours, he is admitted to an accredited law school, 28 semester hours completed in law school may be counted toward meeting the requirements for a Bachelor of Science Degree at Arizona State University. Since the 28 semester hours of the first year of law school are accepted as electives for the Bachelor of Science Degree in business administration, this program permits no electives during the first three years.

The student who wishes to enter law school upon the completion of 98 hours and to use credits earned in law school to qualify for the Bachelor of Science Degree must complete all general education requirements, all core requirements of the College of Business Administration, and a field of specialization as indicated below:

General Education (See pages 72-75)	47 hours
College of Business Administration Core Curriculum (See page 137)	33 hours
Field of specialization in accounting, economics, or finance (See below)	18 hours

FIELD OF SPECIALIZATION REQUIREMENTS:

Accounting

AC 201	Inter. Accounting	3
AC 202	Inter. Accounting	3
AC 331	Cost Accounting	3
AC 383	Adv. Accounting	3
AC 451	Fed. & St. Inc. Tax	3
AC 481	Auditing Theory and Practice	3

Economics

EC 321	Labor Econ.	3
EC 401	Inter. Price Analysis	3
EC 402	Econ. of I. and E.	3
EC 441	Hist. of Econ. Tht.	3
EC 453	Gov't. and Business	3
EC 301	Money and Banking	3

Finance

FI 301	Money and Banking	3
FI 441	Investments	3
FI 461	Cases in Business Finance	3
AC 201	Inter. Accounting	3
AC 415	Financial Statement Analysis	3
EC 341	Public Finance	3

A grade point ratio of 2.00 or above is required in both the course work taken at Arizona State University and in the school of law.

Students who pursue this program must obtain a statement in writing from the Dean of the College of Business Administration giving senior-in-absentia privileges before entering the law school. At the end of his first year in law school, the student must have completed a total of 126 hours of college credit in pre-law and law combined. He must then present a signed testimonial from the dean of the law school to the Registrar at Arizona State University, which shall include a statement of courses taken, grades achieved, and a recommendation that the degree of Bachelor of Science be granted by this University.

A student following the three-year pre-law curriculum should consult the pre-law adviser in the College of Business Administration upon his first enrollment at Arizona State University.

SPECIAL SECRETARIAL PROGRAM

A special program is offered for those who do not plan to complete a four-year degree program but who wish to qualify for office positions in one or two years of study. Students who complete the curriculum outlined below and meet departmental standards will receive a certificate of proficiency. The 64-hour program may be completed in less than two years by enrollment in summer sessions.

A student who has had previous instruction in typewriting and shorthand may be required to enter advanced courses. Additional business subjects may be included to meet the student's needs. A student who decides later to complete a degree program may count the courses earned in the special secretarial program as regular credit toward the degree, but must complete all requirements as outlined in a degree curriculum.

FIRST YEAR

			Sem. Hrs.
1-EN	101, 102	First-Year English	6
1-PE	101, 102	Freshman Physical Education	1
1-PY	100	Elementary Psychology	3
GB	101	Introduction to Business	3
OA	101	Basic Typewriting	2
OA	113	Shorthand	3
OA	143	Business Machines	2
OA	201	Advanced Typewriting	3
OA	214	Shorthand	3
OA	232	Records Systems and Filing	2
1-Humanities			4-6
			32-34

SECOND YEAR

			Sem. Hrs.
1-SE	100	Elements of Speech	2
AC	101, 102	Elementary Accounting	6
GB	233	Business Communication	3
GB	301	Mechanized Data Processing	3
OA	312	Transcription	4
OA	331	Secretarial Procedures	3
OA	344	Office Appliances	2
OA	351	Principles of Office Management	3
Electives			6-8
			32-34

BILINGUAL SECRETARIAL PROGRAM
(French, German, Russian, Spanish)

This degree program is offered jointly by the Department of Foreign Languages and the Department of Office Administration and Business Education. Students interested in this program should consult the Chairman, Department of Foreign Languages.

COLLEGE OF EDUCATION

G. D. McGRATH, Ph.D., Dean

PURPOSE

The purposes of the College of Education are to promote interest in the teaching profession and to prepare students to carry on effective work as teachers, administrators, or other educational specialists in the nation's schools as well as in institutions of higher education. To accomplish these ends, the aim is to prepare the student thoroughly to understand human nature, to know educational subject matter, to be able to use the best methods of teaching and administration, and to participate ably in our democratic society.

It is the belief of those concerned with teacher education that those who work with the children and youth in our schools should be educated as well as trained. In order to accomplish this, a wide array of cultural, academic, professional, and general education background is provided. It is believed that a teacher trained under these circumstances will live wholesomely and happily as well as realize his greatest potentialities while rendering a genuine service along the way. The College of Education is dedicated to the tasks herein set forth as well as to provide a program of training leading to the degrees and certificates listed below.

ORGANIZATION

The courses of instruction offered by the College of Education are organized into departments so that a well-related sequence is established for important areas of concentration or specialization. These subject fields make for better organization in selecting courses which meet requirements for the various teacher education curriculums. A wide array of specialization possibilities thus exists.

For administrative purposes, these subject fields are organized into the following departments: Elementary Education, Secondary Education, Educational Administration and Supervision, Educational Foundations, Counseling and Educational Psychology, Educational Services, and Library Science.

The subject fields which are offered follow:

1. Adult Education
2. Audio-Visual Education
3. Counselor Education
4. Educational Administration and Supervision
5. Educational Foundations
6. Educational Psychology
7. Elementary Education
8. Higher Education
9. Indian Education
10. Library Science
11. Secondary Education
12. Social and Philosophical Foundations
13. Special Education

There are several bureaus or centers which directly assist in the work of the College of Education. These include the Testing Service, The Bureau of Educational Research and Services, the Campus Laboratory School, the Indian Education Center, the Reading Center, the Counseling Center, the Center for Higher Education, and others throughout the university. All of these facilities serve as laboratories for educational training.

DEGREES

BACHELOR OF ARTS IN EDUCATION

The Bachelor of Arts in Education Degree is awarded after successful completion of a four-year curriculum in teacher education. A minimum of 126 semester hours is required for each of the curriculums. A balanced program of activities for this degree provides work in well recognized basic areas.

MASTER OF ARTS IN EDUCATION

A graduate program consisting of a minimum of 30 semester hours of properly arranged work leads to the degree of Master of Arts in Education. Students who complete any of the teacher education curriculums at Arizona State University may arrange for a program of studies leading to the degree of Master of Arts in Education. This degree is also available to graduates of other recognized institutions of higher learning by meeting the prescribed requirements. For specific reference to this program, see Graduate College section in this catalog.

EDUCATION SPECIALIST

The degree, Education Specialist, is awarded for satisfactory completion of the Specialist Program of graduate studies. For specific reference to this degree, see Graduate College section in this catalog.

DOCTOR OF EDUCATION

The degree, Doctor of Education, is awarded for satisfactory completion of the Doctoral Program of graduate studies. For specific reference to this degree, see Graduate College section in this catalog.

DOCTOR OF PHILOSOPHY

The degree, Doctor of Philosophy (Education), is awarded for satisfactory completion of this Doctoral Program of graduate studies. For specific reference to this degree see Graduate College section in this catalog.

CERTIFICATION

ARIZONA CERTIFICATION

For complete details concerning certification, students should refer to the Rules and Regulations published by the State Board of Education, or consult with the Dean of the College of Education.

The College of Education at Arizona State University is accredited by the National Council for Accreditation of Teacher Education for the preparation of elementary and secondary teachers and school service personnel with the Doctor's degree as the highest degree approved. Teacher education curricula meet the requirements for the appropriate Arizona certificate, and graduates of the NCATE accredited programs enjoy reciprocity in certification in all states participating in this practice.

SELECTIVE ADMISSION AND RETENTION

In order to enroll in the courses in Elementary or in Secondary Education leading to the Bachelor of Arts in Education degree, it is required that the student have been enrolled in the College of Education and that he be under the selection and retention program of the College of Education. Prior to admission to a graduate program leading to a degree, or to an approved program leading to certification, students who have not completed an undergraduate program in an NCATE institution shall be required to make up deficiencies and meet standards for admission and retention as identified by the Standards Committee of the College of Education. Courses identified as a part of an approved program leading to certification shall not be open to students who have not been admitted to a degree program or to the approved program leading to certification.

The Selection and Retention Policy of the College of Education has inherent in it the following purposes:

1. To select those students for admission to a teacher education curriculum who are capable of pursuing and completing the curriculum.
2. To assist students in identifying their strengths and weaknesses so that they may realize their greatest potential in education.
3. To improve the quality of the teachers prepared at this institution.
4. To attract able students to the profession and more specifically to the various curricula of the College of Education.
5. To provide a framework for follow-up research on the education of teachers.

1. *Admission to a Professional Teacher Education Program*

A student will be admitted to a Professional Program of the College of Education if:

- a. He is granted admission to Arizona State University.
- b. He demonstrates satisfactory performance on the qualification test.
- c. He shows satisfactory achievement on standardized examinations in speaking, listening, writing, reading, computing and studying.
- d. He meets the general requirements in mental and physical health.
- e. He has a grade point index of 2.00 or higher in his general education courses, 2.00 or higher in courses in his major teaching field, and 2.00 or higher in his professional courses.
- f. His written application is accepted by the Standards Committee of the College of Education.

If a student fails to meet the above listed conditions, he may petition the College of Education Standards Committee for admission with consideration of complete pertinent individual information. Conditional admission may be given if, in the judgment of the Standards Committee, the student has correctible deficiencies.

2. *Admission to Directed Teaching*

A student shall be admitted to Directed Teaching if:

a. He has achieved admission to the Professional Program of the College of Education.

b. He has obtained the recommendation of his adviser, chairman of the department fielding the courses in his major teaching field, and chairman of the appropriate department.

c. He has been approved by the Standards Committee of the College of Education.

3. *Approval for Graduation*

A student shall be graduated from the College of Education at Arizona State University if:

a. He completes a duly authorized teacher education curriculum of at least 126 semester hours of study.

b. He has a grade point index of 2.00 or higher in general education courses, 2.00 or higher in the courses in his major teaching field, and 2.00 or higher in his professional courses.

c. His written application for graduation is accepted by the Standards Committee.

d. He is recommended for graduation by the faculty of the College of Education.

4. *Provision for Continuous Evaluation*

The Standards Committee, in addition to administering the specifically designated steps of the selection and retention program, shall evaluate a student at any time it considers it important and necessary to do so.

5. *Follow-up Study of Graduates*

Follow-up studies of alumni of the College of Education shall be conducted:

a. To determine which of them enter the profession and how long they remain in the profession.

b. To obtain recommendations concerning them from their immediate supervisors.

c. To analyze observations of them in their professional pursuits.

DIRECTED TEACHING

ADMISSION

Admission to directed teaching is a phase of the program of selection and retention of students in the College of Education. Undergraduate students in the Elementary Education Curriculum must be approved by the Standards Committee and by their advisers. Undergraduate students in the Secondary Education Curriculum must be approved by the Standards Committee, their advisers, and the representative of the faculty fielding the subject in which they will be assigned for student teaching. Graduate students must be approved by the same agencies as undergraduate students. Students should be admitted to the College of Education and enrolled in an approved teacher education program to be eligible for admission to directed teaching.

APPLICATION

Students who apply for directed teaching must have completed at least 12 semester hours of courses at Arizona State University prior to the date on which they begin their student teaching assignment.

Application for directed teaching must be made with the Director of Student Teaching prior to July 1 for an assignment during the fall semester, prior to November 15 for an assignment during the spring semester, and prior to April 15 for an assignment during the summer session. Applications for summer session directed teaching will be accepted only from those students who will have completed all other requirements for degrees and certificates except the student teaching requirement, and a limited number of assignments will be made on a first-come, first-served basis. The opportunities for directed teaching experiences in the summer are extremely limited, and no student should definitely plan to meet this requirement during the summer.

Students who apply for directed teaching after the deadlines named above may not be assigned to directed teaching until the next following spring or fall semester.

REQUIREMENTS

Students in the Elementary Education Curriculum, whose programs permit, devote their full time to directed teaching all day in the cooperating schools, one full week for each semester hour of credit in directed teaching. Others teach in the cooperating schools for one-half days for one semester. In either case, the directed teaching occurs during the first or second half of the third or fourth year in the program. Students who are preparing for secondary certification teach for one-quarter day for one full semester in either the first or second half of the fourth year. Required conferences are held during the directed teaching period. The student's load is limited to 16 semester hours during the semester in which he is teaching. Student teachers are not permitted to take part in activities that interfere with their directed teaching, conferences, or other activities related to teaching in the cooperating school.

Students must count full time or part time employment as part of their load while they are doing directed teaching. Each five hours of employment per week will be considered equivalent to a load of one semester hour in calculating the total 16 semester hour load permitted during the semester in which the student is teaching. It is recommended that students plan not to be employed during the directed teaching period.

TRAINING SCHOOLS AVAILABLE

The University has available many fine schools or school systems for the training of student teachers. Others will be added as the program expands. Each of the schools presents its own particular type of organization and problems so that the student may receive training in any type of work desired from the kindergarten through the high school. All of these are regular public schools; therefore, students obtain their training under actual classroom conditions of the public school. Each student teacher is under direct guidance of a cooperating teacher, a college supervisor, and the Director of Student Teaching.

WAIVER

Students who have been employed as regular teachers in public, parochial, or Indian schools, may apply to the Director of Student Teaching, College of Education, for waiver of the directed teaching requirement. Waiver of directed teaching in the required grade level is granted by the Director of Student Teaching. Waiver of this requirement in no way changes the total number of semester hours required for graduation or for establishing residence.

Regular teaching experience in the required grade level of two years' duration within the past five years will be considered sufficient to waive the total directed teaching requirement.

Regular teaching experience in the required grade level of one year's duration within the past five years will be considered sufficient to waive one-half the directed teaching requirement.

Regular teaching experience of two or more years' duration prior to the past five years will be considered sufficient to waive one-half the directed teaching requirement.

Students who have met the full directed teaching requirement of another American Association of Colleges for Teacher Education member institution, which is also accredited by the National Council for Accreditation of Teacher Education, may petition through the College of Education Standards Committee to have their directed teaching experience requirement interpreted as fully met.

HONORS PROGRAM

An Honors Program is available within the College of Education for the exceptional student. It is administered by the Standards Committee which serves as an Honors Council. A more detailed description of this program will be found in the Honors Program section of this catalog, page 76.

BACHELOR OF ARTS IN EDUCATION

ELEMENTARY CURRICULUM

The Elementary Curriculum offers specialized training for students who wish to teach in nursery school, kindergarten, or in elementary school grades. The specializations for which special programs are available include early childhood education, lower elementary grades, intermediate grades, and upper elementary grades. The courses are designed to give the student a better understanding of young children, and of their total personality development during the early years of their school adjustment. Special emphasis is given to the growth and development of the child, and how he learns as he progresses through the grades in the elementary school.

This curriculum leads to the degree of Bachelor of Arts in Education and to certification for teaching in the kindergarten and grades one through eight.

Major and Minor Teaching Fields. The major in this program is in elementary education. A minor teaching field is also required. Students who wish to do so may elect to pursue a minor of 18 or more semester hours by utilizing elective hours available, and may also pursue several courses in other academic fields.

Suggested Pattern. A program of 126 approved semester hours is required. This is divided as follows:

General Education	40 semester hours

Includes state certification requirements for United States and Arizona Constitutions.

Communications	6 sem. hrs.
Humanities	8 sem. hrs.
Behavioral and Social Sciences	8 sem. hrs.
Sciences and Mathematics	8 sem. hrs.
Physical Education and Health	1 sem. hr.
General Education Electives	9 sem. hrs.

For specific courses for each of the above groups, consult topic on General Education for all curriculums.

Elementary Professional Education	36 sem. hrs.
Minor Teaching Field	18 sem. hrs.
Military or Air Science (for men)	6 sem. hrs.
Electives	26 or 32 sem. hrs.

Advisers in this curriculum have check sheets with recommended and required courses for each year of work. These check sheets contain appropriate patterns of course work for the age level of pupils with whom the students as teachers will want to work. The check sheets also contain recommendations for electives. It is necessary for students to consult advisers in this curriculum in order to insure the best possible program of training. This is particularly important inasmuch as the adviser must sign the checkout sheet for graduation which indicates that an approved program of course work has been developed.

Students interested in learning to work with children and youth, but not in certification, may elect some elementary education courses.

SECONDARY CURRICULUM

This curriculum prepares students for service in the secondary school. Majors and minors are completed in the teaching fields desired. The curriculum has considerable flexibility for those who wish to pursue specialized work in addition to the regular expectations for teaching. This curriculum leads to the degree of Bachelor of Arts in Education and to the certification for teaching in the secondary school.

Suggested Pattern. A program of 126 approved semester hours is required. This is divided as follows:

General Education	40 semester hours

Includes state certification requirements for United States and Arizona Constitutions.

Communications	6 sem. hrs.
Humanities	8 sem. hrs.
Behavioral and Social Sciences	8 sem. hrs.
Sciences and Mathematics	8 sem. hrs.
Physical Education and Health	1 sem. hr.
General Education Electives	9 sem. hrs.

For specific courses for each of the above groups, consult topic on General Education for all curriculums in this catalog. United States and Arizona Constitution is a state teacher certification requirement and may be included in the General Education Behavioral and Social Sciences field. School and Community Health (HE 360) is recommended as a preferred General Education elective course in the Secondary Curriculum. Courses included in the General Education requirements may be applied toward meeting the requirements of the major or minor teaching fields. This is explained in the paragraph under *Major and Minor Teaching Fields.*

Major Teaching Field	45 semester hours
Minor Teaching Field	18 semester hours
Professional Education	25 semester hours

The following are required:

EF 111 Exploration of Education
EF 222 Psychological Foundations of Education
EF 333 Issues in Teaching
SE 311 Principles and Curricula of Secondary Schools
SE 411 Methods of Teaching and Evaluating in the Secondary Schools
Methods of Teaching in the Major Teaching Field
SE 433 Directed Teaching in the Secondary School

Military or Air Science (for men)	6 semester hours

Electives (as needed to fill out 126 semester hours).

Advisers in this curriculum have check sheets with recommended courses for each year of work. The check sheets include recommendations for electives. Students should consult advisers in this curriculum in order to insure the best possible program of training. This is very necessary for the following reasons: (1) An adviser approves a program of studies prior to registration each semester. (2) An adviser signs the graduation checkout sheet for the student. (3) Check sheets are revised each year on the basis of refinements which are incorporated into the program. (4) Check sheets offer excellent opportunity for the student to keep a record of his progress throughout the curriculum.

Major and Minor Teaching Fields. Students under the secondary curriculum are required to complete a major and a minor teaching field.

A major teaching field shall consist of 45 semester hours. A minimum of 18 semester hours in the major teaching field should be upper division courses. Wherever practicable, general education courses which are appropriate should be used to meet the requirements of a major teaching field. Courses included in the general education requirements or options, if taken, may be applied toward meeting the semester hour requirements of a major teaching field if such courses are specified as required courses for the major teaching field, or if approved by the adviser as satisfying major teaching field requirements. However, students should not use hours credited to the development of a major to apply on hours needed to develop a minor.

A minor teaching field shall consist of 18 semester hours in a subject field from one department or division. In order to meet the various graduation requirements under the secondary curriculum, it is usually necessary to use general education courses to build the minor teaching field, as approved by the adviser.

In selecting major and minor teaching fields, students should keep in mind the requirements of the North Central Association and the combinations usually assigned beginning teachers in Arizona high schools. Information concerning these matters may be obtained at the office of the Chairman of the Department of Secondary Education.

MAJOR TEACHING FIELDS AVAILABLE

- Art
- Biological Sciences
- Business
- Chemistry
- Choral Music
- Distributive Education
- Double Music Major
- English
- French
- General Science
- Geography
- Geology
- German
- Health Education
- History
- Home Economics
- Industrial Arts
- Instrumental Music
- Journalism
- Mathematics
- Physical Education
- Physics
- Political Science
- Russian
- Spanish
- Speech and Dramatics

MINOR TEACHING FIELDS AVAILABLE

In addition to minors in the above fields, the following minors are available:

- Dramatics
- Driver Training and Safety Education
- Economics
- Electronics
- General Business
- Journalism
- Latin
- Library Science
- Music
- Physical Sciences
- Psychology
- Russian
- Secretarial
- Sociology
- Speech
- Transportation and Power

Other minors can be developed with the approval of the chairman of the department under which the minor is developed or the Dean of the College of Education.

Considerable attention should be given to the selection of teaching combinations. In many instances, teachers must assume positions which call for a major and one or two minors. Although there is no definite pattern concerning teacher combinations, it should be profitable to consider the more prevalent ones. Information regarding these may be obtained from the student's adviser, the Director of Placement, or a Member of the Secondary Education Department.

Professional Education. In addition to the courses listed under other requirements, all students registered under the secondary curriculum are required to take 25 semester hours of work in Education. The following must be included: EF 111, 222, 333; SE 311, 411, Methods of Teaching in the Major Teaching Field and SE 433.

Recommended Electives and Specialization. Students are urged to plan electives in conjunction with suggestions from their advisers.

REQUIRED COURSES IN MAJOR AND MINOR TEACHING FIELDS

The major teaching field requires a minimum of 45 semester hours worked out in consultation with the adviser. The minor teaching field requires a minimum of 18 semester hours worked out in consultation with the adviser. For specific course requirements in the major and minor teaching fields see statements in the Departments of Instruction section of the catalog at the beginning of each department offering a major or minor teaching field.

LIBRARY SCIENCE

Students who desire to prepare for librarianship may choose a minor field in library science. The undergraduate program of professional education for librarians should also include a systematic survey of the various fields of knowledge, concentration in one or more subject fields taught in Arizona schools, background courses of special value in library science, study of professional principles and methods common to all libraries.

Students who have completed a minor field in library science at the undergraduate level may select library science as a field of specialization at the graduate level.

Minor Field in Library Science. The minor in library science consists of 18 semester hours as prescribed by the department.

These courses vary in terms of the needs and interests of the student.

SPECIAL PROGRAMS

SPECIAL PROGRAMS OF TEACHER PREPARATION

Several fields of specialization are available on the undergraduate level in connection with any of the undergraduate curriculums. These are available as a sequence of courses to be taken in addition to the regular requirements of the undergraduate curriculum.

TEACHING THE HEARING-HANDICAPPED CHILD

Students pursuing the elementary program may, in the junior year, with the approval of the adviser, elect to take a special sequence preparatory to the teaching of hearing-handicapped children in regular or special classroom situations. These students shall be required to complete satisfactorily the basic four-year elementary program. Specific requirements for this minor may be obtained from the regular adviser, or from the adviser in Special Education.

Students pursuing a major teaching field in secondary education may also include this field of Special Education. Such students shall be required to complete satisfactorily the basic four-year secondary major. The special courses follow:

SP	311	Orientation to Education of Exceptional Children	3 sem. hrs.
1-SE	421	Speech Correction	3 sem. hrs.
1-SE	424	Phonetics	2 sem. hrs.
1-SE	425	Audiology	3 sem. hrs.
1-SE	426	Audiometry	3 sem. hrs.
1-SE	427	Clinical Practice in Audiology and Audiometry	3 sem. hrs.
*EE	478	Directed Teaching in the Elementary School	5 sem. hrs.
or			
SE	433	Directed Teaching in the Secondary School (3)	
SP	455	Education of the Hearing-Handicapped	3 sem. hrs.
SP	456	Education of the Hearing-Handicapped	3 sem. hrs.
			26 or 28

TEACHING INDIAN CHILDREN

Students pursuing the elementary program may, in the junior year, with the approval of the adviser, elect to take a special sequence preparatory to the teaching of Indian children. This is appropriate for those who will have only a few Indian children in a classroom, or for those who will have a classroom composed only of Indian children. These students shall be required to complete satisfactorily the basic four-year elementary program.

Students pursuing a major teaching field in secondary education may also take this special training for teaching Indian children. Such students shall be required to complete satisfactorily the basic four-year secondary major.

IE	322	Methods and Materials for Teaching Indian Children	3 sem. hrs.
IE	333	Curriculum and Practices for Indian Education	3 sem. hrs.
IE	490	Problems of Teachers of Indian Children	3 sem. hrs.
*EE	478	Directed Teaching in the Elementary School	5 sem. hrs.
or			
SE	433	Directed Teaching in the Secondary School (3)	
1-AN	221	Indians of the Southwest	3 sem. hrs.
1-AN	421	The American Indian	3 sem. hrs.
			18 or 20

TEACHING SPANISH IN THE ELEMENTARY SCHOOL

Students pursuing the elementary program may, with the approval of the adviser, elect to take a special sequence preparatory to the teaching of Spanish in the elementary school. These students shall be required to complete satisfactorily the basic four-year elementary program.

SP	101, 102	Elementary Spanish (or two years of Spanish in high school)	8 sem. hrs.
SP	201, 202	Intermediate Spanish	8 sem. hrs.
SP	311, 312	Spainsh Conversation	6 sem. hrs.
SP	417g	Spanish Phonetics	2 sem. hrs.
SP	472g	Spanish-American Civilization	3 sem. hrs.
FL	421g	Directed Reading for Foreign Language Majors	2 sem. hrs.
FL	480g	Methods of Teaching Foreign Languages	3 sem. hrs.
			32

SP 321, 322 Survey of Spanish Literature, may be substituted for FL 421g Directed Reading for Foreign Language Majors.

HI 441g Study Tour to Mexico or SP 401g Spanish Language Study Abroad, may be substituted for SP 472g Spanish-American Civilization.

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*Half in a program with hard-of-hearing children; half in a "regular" school situation.

Elementary teachers in the field desiring a program to prepare for teaching Spanish in the elementary schools may take the following sequence of courses: SP 485g, 486g, 487g, and 488g.

OTHER SPECIAL PROGRAMS

Students pursuing the elementary program may, with the approval of the adviser, elect to take a special sequence preparatory to specialization in a special field in the elementary school. Examples of this are in the field of Art, Physical Education, Home Economics, Music, Industrial Arts, Conservation Education, Safety Education, and others. These students shall be required to complete satisfactorily the basic four-year elementary program.

COLLEGE OF ENGINEERING SCIENCES

LEE P. THOMPSON, Ph.D., Dean

PURPOSE

The purpose of the College of Engineering Sciences is to provide a university education of such fundamental background and scope that a student may achieve competency in one of the fields of Engineering, Agriculture, or Technology. The Research Center provides an opportunity for the students to augment their theoretical knowledge with research, development, and engineering experience. Every effort is made to carry on a well rounded, well integrated program which will not only give the student proficiency in his professional field but also will develop character, judgment, ideals, breadth of view, general culture, and physical well-being.

ORGANIZATION

The College of Engineering Sciences is organized as follows:

- Engineering Faculties
  - Chemical Engineering
  - Civil Engineering
  - Electrical Engineering
  - Engineering Science
  - Industrial Engineering
  - Mechanical Engineering
- Division of Industrial Design and Technology
- Division of Agriculture
- Computer Center
- Research Center

DEGREES

BACHELOR'S DEGREES

The completion of a four-year curriculum in agriculture and technology leads to the degree of Bachelor of Science. The completion of a four-year curriculum in engineering leads to the degree of Bachelor of Science in Engineering.

MASTER OF SCIENCE IN ENGINEERING

The Master of Science in Engineering degree is awarded upon successful completion of prescribed graduate level course work and research endeavor. The student's program of study is administered under an adviser with the approval of the Dean. Areas of specialization available are: Chemical, Civil, Electrical, Industrial, Mechanical, and Engineering Science. Within programs of study, interdisciplinary emphasis can be arranged. For example, bio-engineering may include course work in the biological sciences, psychology, and engineering.

MASTER OF SCIENCE

This graduate program is designed to provide the competent student in engineering or other selected fields, an opportunity to specialize in a particular subject area within engineering. Normally this objective may be attained through the satisfactory completion of graduate-level coursework and research endeavor.

DOCTOR OF PHILOSOPHY

The degree Doctor of Philosophy is awarded in engineering upon the satisfactory completion of an approved program of graduate study and research. For specific reference to this degree, see the Graduate College section.

GENERAL EDUCATION

Higher education should provide the student not only with competency in his chosen subject field, but also with experiences which facilitate the student's growth in ability to perceive significant relationships, to make intelligent value judgments, to express himself with ease, clarity, and good taste, and to develop the qualities of character and personality requisite for a successful career. For these reasons the student's curriculum will include study in communications, the humanities, the social sciences, the sciences, and physical education. The order in which the selected courses of study are taken is not prescribed, although in certain degree programs specific courses may be recommended. In all cases, prerequisites must be followed.

The General Education requirements under each of the curriculums offered in the College of Engineering Sciences include the following:

Communications	6 sem. hrs.
Behavioral and Social Sciences	8 sem. hrs.
Humanities	8 sem. hrs.
Sciences and Mathematics	8 sem. hrs.
Physical Education and Health	1 sem. hr.
General Education Electives	9 sem. hrs.

Note: All courses should be chosen with the approval of the student's adviser. See General Education courses. Engineering students should note special requirements listed below:

Humanities and Social Studies Requirements for Students Enrolled in Engineering

Humanities—Required: 8 or 9 hours minimum

Option I: Select courses from the following list with at least three fields represented. (AC 100, AC 301, AC 311, AC 312, AC 317, AC 413, AC 414, AH 211, AH 212, AH 313, AH 321, AH 417, EN 103, EN 201, EN 202, EN 204, MU 107, MU 355, MU 356, PI 101, PI 322, PI 323, PI 328)

Option II: HU 301 and HU 302 6

One additional course from Option I above .... 2 or 3

Option III: HU 101 and HU 102 8

Behavioral and Social Sciences—Required: 9 or 8 hours minimum

EC 201 Principles of Economics 3

Select two courses from the following .... 6 or 5

(AN 111, EC 202, HI 101, HI 102, HI 103, HI 104, HI 301, HI 302, HI 303, HI 304, HI 305, HI 306, HI 325, ME 201, ME 300, ME 301, ME 302, PS 100, PS 250, PS 310, PS 313, PS 331, PS 351, PS 441, PS 442, PY 100, PY 112, SO 301)

Total hours required for Humanities and Social Sciences 17

HONORS PROGRAM

Students in the College of Engineering Sciences are eligible to participate in the Honors Program as administered by the particular Honors Council of the School or Division in which the student is enrolled. See page 76 for further information.

SCHOOL OF ENGINEERING

LEE P. THOMPSON, Ph.D., Director

PURPOSE

The Engineering Program seeks the attainment by each graduate of certain broad objectives, and it is designed to make effective a philosophy of education for careers in applied science, engineering, and industry for leadership in the second half of the twentieth century.

The curriculums and courses offered are designed to meet the needs of the following students: (1) Those who wish to obtain a Bachelor of Science in Engineering degree and who plan careers in fields where science, mathematics, and analytical methods are of special value; (2) Those who wish to do graduate work in engineering; (3) Those who wish one or two years of training in mathematics, applied science, and engineering in preparation for a technical program; (4) Those who desire pre-engineering for the purpose of deciding which engineering field to undertake or those who desire to transfer to another college or university; (5) Those who wish to take certain electives in these fields while pursuing another curriculum in the University.

ADMISSION

Students who wish to be admitted to full freshman standing in Engineering should present certain secondary school units in addition to the minimum University requirements. A total of 3½ units is required in mathematics. Included must be: advanced algebra, geometry, and trigonometry. Calculus is recommended. The laboratory sciences chosen must include at least one unit in physics and one unit in chemistry. One unit of biology is strongly recommended.

Students who have omissions or deficiencies in subject matter preparation may be required to complete additional university credit coursework which may not be applied toward an engineering degree. The most common deficiencies and the corresponding courses which may be taken are: algebra —MA 117 College Algebra; trigonometry—MA 118 Trigonometry; physics— PH 111 General Physics; English—EN 101 College English; chemistry—CH 113 General Chemistry.

Credit is granted for transferred courses which are substantially equivalent to corresponding courses in an engineering program subject to grade and senior resident requirements. Such credits are provisional and become final only after the student has demonstrated his ability to do satisfactory work. Credits will be accepted by transfer from a Junior College to meet lower division requirements only. The status of a student and the specific credits acceptable toward his degree are determined by the Dean of the College.

Well prepared students can usually complete the plan of study leading to the degree of Bachelor of Science in Engineering in any of the engineering curricula in four years. Many students, however, may find it advantageous or necessary to devote more than four years to the undergraduate engineering programs of study by pursuing at one time, in any semester, fewer studies than are regularly prescribed. In cases of inadequate secondary preparation, poor health, or financial necessity requiring much time for outside work, the undergraduate course should be extended to five years or longer. A student who so desires may devote five years to his undergraduate work and include additional instruction in the humanities, the social sciences, the physical sciences or mathematics.

ORGANIZATION

Fields of specialization have been developed around an engineering core. The engineering core consists of a highly correlated group of courses of fundamental importance and basic concern to engineers. It constitutes a broad base of science, mathematics, and engineering upon which the various fields of specialization are founded. Instructional patterns are basically variations of a single curriculum, and the student is allowed considerable latitude in developing an instructional pattern to fit his particular interests. In each of the several fields of specialization, the scientific knowledge and techniques are applied and further developed through analysis, synthesis, and design in a definite engineering discipline. For convenience, all of the fields of specialization offered are designated as KE, CE, EE, ES, IE, and ME.

BACHELOR OF SCIENCE IN ENGINEERING

The satisfactory completion of a curriculum of a minimum of 127 semester hours, including general education, an engineering core curriculum, and both required and elective courses of study in a field of specialization, leads to the degree of Bachelor of Science in Engineering. Where omissions or deficiencies exist, i.e., in chemistry, English, physics, or mathematics, the student will need to complete more than the mimimum of 127 semester hours.

The principal fields of specialization in the engineering curriculum are devoted to the basic sciences, mathematics, the fundamentals of engineering science, and their application to the solution of engineering problems. These courses are not training courses for any of the mechanical or manipulative skills, but rather, are planned to provide preparation for development, design, research, graduate work, and, with certain electives, for operation, production, testing, maintenance and management.

In any field of specialization the degree requirements consist of the engineering core, the general education requirements, and the courses in a field of specialization. In addition to these 127 semester hours, six semester hours are required in air science or military science for all male students, unless exempt.

For assistance and counsel in planning a program, each student will be assigned an adviser from the instructional staff in his special interest field.

ENGINEERING CORE

ME	102	Introduction to Engineering	2
ME	141	Engineering Graphics	3
CH	114	General Chemistry	4
MA	120	Analytical Geometry and Calculus	4

MA	121	Analytical Geometry and Calculus	4
MA	212	Analytical Geometry and Calculus	4
PH	251	Sound and Optics	2
ES	211	Engineering Mechanics	3
ES	231	Electrical Science	3
MA	360	Differential Equations and Fourier Analysis	3
PH	361	Modern Physics	3
EE	301	Electrical Networks	4
ES	312	Engineering Mechanics	3
ES	321	Mechanics of Materials	3
EE	331	Electronic Engineering	3
ES	350	Theory of Material Properties	3
ES	371	Fluid Mechanics	3
ES	381	Thermodynamics	3
ES	400	Technical Communications	3

The engineering core is common to all fields of specialization. It gives the student time to become adjusted, and to choose the field of specialization for which he is best adapted. Counseling is provided in order that the student may be aided in making his choice.

With the approval of his faculty adviser, an engineering student with appropriate preparation and objectives may choose one or more of the following alternatives: ZO 100 or KE 118 to replace CH 114; MA 220 or ES 365 to replace MA 360; CH 441 or PH 461 or ME 411 to replace PH 361. To obtain the necessary chemical science background, chemical engineers may use the following alternatives: CH 442 for ES 350, KE 331 for ES 371, and KE 441 for ES 381.

Engineering students will complete the engineering core courses, the general education courses (including 17 semester hours minimum from the Social Sciences and Humanities) and the field of specialization requirements. Required and elective courses for each field of specialization are listed below and changes may be made only with the approval of the Dean.

Technical electives are selected with the approval of the student's faculty adviser and may be made from 300 level courses or above in engineering, mathematics, the sciences, business administration, or foreign languages.

Any student whose written or spoken English in any course is unsatisfactory may be reported by the instructor to the Dean. The Dean may assign supplementary work, including additional coursework, consistent with the needs of the student. The granting of a degree may be delayed until the work is satisfactorily completed.

Prior to enrolling in courses at the 300 level, each engineering student must: (1) receive approval from the office of the Dean of Engineering; (2) secure from his adviser an approved course of study for his remaining work. Generally, students with a 2.00 scholarship index (C average), or higher will receive approval.

CHEMICAL ENGINEERING

The chemical engineer is generally concerned with processes involving a chemical change or separation. He applies science, especially chemistry and physics, to the development, design, and operation of process equipment. Mathematics is his tool and economics his guide in practice. His training often leads to research and development activities for which graduate study is desirable, but the bachelor's degree has sufficed for the majority. Since chemistry is involved in most activities, the chemical engineer is found in a diversity of industries which manufacture metals, ceramics, space propellants, transistors and other solid state devices, petroleum products, plastics, food, drugs, fermentation products, petro-chemicals, and conventional chemicals. Extractive metallurgy and nuclear engineering are chemically based fields which come within the realm of chemical engineering. Training in chemical engineering provides a broad background which prepares one for a variety of occupations.

CHEMICAL ENGINEERING CORE

KE	211, 212	Chemical Process Calculations	4
KE	331	Transport Processes	4
KE	332	Chemical Engineering Operations	4
KE	333	Transport Phenomena Laboratory	1
KE	441, 442	Chemical Process Principles	6
KE	451, 452	Chemical Engineering Laboratory	4
KE	461	Process Control	3
KE	462	Process Design	4
CH	331, 332	General Organic Chemistry	8
CH	421	Instrumental Analysis	4
	or 1-CH 225	Quantitative Analysis	(4)
CH	441, 442	General Physical Chemistry	6
CH	443	General Physical Chemistry Lab	1
		Approved Mathematics Elective	3
		Approved Technical Electives	6

CIVIL ENGINEERING

Civil engineers are responsible for the research, development, design, and construction of the structures that form the basis of our modern civilization. These include buildings of all types, bridges, highways, dams, canals, irrigation, and multipurpose hydraulic systems. Civil engineering further encompasses portions of environmental engineering; including city planning, water resources development and supply, waste treatment, and engineering aspects of environmental health. Education in this field is founded on scientific fundamentals with extensive training and practice in one or more fields of professional specialization including structural, hydraulic, soil mechanics, transportation, and sanitary engineering.

CIVIL ENGINEERING CORE

CE	241	Surveying	3
CE	311	Materials of Engineering	2
CE	321	Structural Mechanics	3
CE	322	Theory of Design	4
CE	381	Hydraulic Engineering	3
CE	385	Fluid Mechanics Laboratory	1
CE	423	Structural Design	3
CE	451	Soil Mechanics	3
CE	461, 462	Sanitary Engineering	6
CE	472	Transportation Engineering	3
CE	492	Topics in Civil Engineering	1
		Approved Mathematics Course	3
		Approved Science Course	3
		Approved Technical Electives	8

ELECTRICAL ENGINEERING

Many modern scientific developments are either essentially electrical in character or depend on electrical equipment and technique. This field is very broad since it enters into much of industry and service where power is utilized, intelligence is transmitted, and control is exercised over physical, chemical, or mechanical operations. Areas of current interest include such fields as computing, semiconductor devices, communications, control systems, power systems, radar, medical electronics, electromechanics, instrumentation, and space electronics.

While all students in Electrical Engineering pursue a common program in fundamentals, specialization in various areas of Electrical Engineering is provided through a choice of technical electives. These technical electives are based on a common core of Electrical Engineering fundamentals. The Electrical Engineering Core is in addition to, and integrated with, the Engineering Core.

ELECTRICAL ENGINEERING CORE

EE	226	Digital Computer Programming	2
EE	302	Electrical Networks	3
EE	332	Electronic Engineering	5
EE	341	Electromagnetic Fields	3
EE	362	Electromechanics	3
EE	401	Electrical Networks	3
EE	430	Electron Devices	3
EE	461	Electrical Machinery	3
EE	480	Feedback Control Systems	4
EE	496	Professional Seminar	1
MA	362	Advanced Mathematics for Engineers	3
		Approved Technical Electives, Minimum Total	13

One course is to be selected from Group A below. Two courses must be selected from one of the other groups below.

Group A: EE 403, EE 426, EE 452, EE 481, IE 471, MA 342, MA 442, MA 426, MA 461, ST 437

Group B: EE 432, EE 431, EE 443, EE 445, EE 490, EE 495

Group C: EE 402, EE 425, EE 433, EE 435, EE 438

Group D: EE 451, EE 462, EE 471, EE 491

Group E: EE 420, EE 421, EE 422, EE 424, EE 429

These courses and additional elective courses will be selected by the student with consent of his adviser with the aim of providing the best preparation of the individual student.

ENGINEERING SCIENCE

The Engineering Science curriculum emphasizes the broad fundamentals of engineering rather than changing techniques and practices. Such an education will give the engineer far more flexibility in understanding and utilizing new developments and techniques as they arise. Additionally, this background will best prepare him for graduate work and self-improvement. By emphasizing depth in engineering science and mathematics, this curriculum serves the ever-increasing need in research and development.

ENGINEERING SCIENCE CORE

EE	332	Electronic Engineering	5
EE	341	Electromagnetic Fields	3
ES	322	Mechanics of Materials	2
ES	372	Fluid Mechanics	3
MA	362	Advanced Mathematics for Engineers	3
		or ES 366 Methods in Engineering Analysis	(3)
ES	421	Vibrations Analysis	3
ES	481	Statistical Thermodynamics	3
ES	483	Heat Transfer	3
ES	491	Engineering Science Laboratory	3
ES	492	Projects in Design and Development	3
		Approved Courses in Mathematics	6
		Approved Technical Electives	9

INDUSTRIAL ENGINEERING

Industrial Engineering is concerned with the design, improvement, and installation of integrated systems of men, materials, and equipment. It draws upon specialized knowledge and skill in the mathematical, physical, and social sciences together with the principles and methods of engineering analysis and design. The purposes of industrial engineering are: (1) to analyze current systems to improve them; and (2) to predict the consequences of decisions prior to their implementation in the system.

Typical job assignments for industrial engineers are in research and development, production control, work methods and measurements, quality control, operations research, factory planning, systems and procedures, product design and development, and sales engineering.

INDUSTRIAL ENGINEERING CORE

AC	332	Accounting for Engineers	4
IE	200	Industrial Engineering	2
IE	311	Engineering Economy	2
IE	322	Work Analysis and Design	3
IE	374	Statistical Quality Control	3
IE	375	Computer Methods and Applications	3
IE	431	Engineering Administration	3
IE	461	Design of Industrial Operations	3
IE	462	Design of Industrial Operations	3
IE	471	Applied Probability for Engineers	3
IE	475	Operations Research	3
ME	230	Materials and Industrial Processes	2
		Approved Technical Electives	12

Industrial engineering students may elect to specialize in one of the *elective* options: Organizational Control, Computer Sciences, Industrial Statistics, Operations Research, Human Factors, Systems Analysis, Production Control, or in a general option. The courses required for these options are indicated below:

IE OPTION AREAS

ORGANIZATIONAL CONTROL. Required Courses: IE 412, IE 437, IE 472. Electives: Students may select a minimum of 5 additional semester hours from the following courses: IE 335, IE 421, IE 439, IE 474.

COMPUTER SCIENCES. Required Courses: IE 463, IE 472, IE 477. Electives: Students may select a minimum of 3 additional semester hours from the following courses: EE 420, EE 425, EE 426, MA 426, MA 464.

INDUSTRIAL STATISTICS. Required Courses: IE 472, IE 474. Electives: Students may select a minimum of 6 additional semester hours from the following courses: IE 342, EE 426, MA 342, MA 362.

OPERATIONS RESEARCH. Required Courses: IE 472, IE 477. Electives: Students may select a minimum of 6 additional semester hours from the following courses: IE 342, IE 472, EE 403, EE 425, MA 342, MA 460.

HUMAN FACTORS. Required Courses: IE 421, IE 472, IE 480. Electives: Students may select a minimum of 4 additional semester hours from the following courses: IE 425, IE 437, IE 439, IE 481, ME 361, PY 323.

SYSTEMS ANALYSIS. Required Courses: IE 463, IE 472, IE 477. Electives: Students may select a minimum of 3 additional semester hours from the following courses: EE 403, EE 425, EE 480, MA 460, ME 361.

PRODUCTION CONTROL. Required Courses: IE 463, IE 472, IE 477. Electives: Students may select a minimum of 3 additional semester hours from the following courses: IE 412, IE 437, IE 474, EE 425, EE 480, ME 361.

GENERAL OPTION. A minimum of 12 semester hours is required. The sequence of courses selected should have continuity and approval of the student's faculty adviser. This approval must be secured prior to enrollment. Normally courses should be selected from the above option groups, or from 300 level courses or above in any engineering area, the physical sciences, mathematics, business, or foreign language.

MECHANICAL ENGINEERING

Mechanical engineers are used for such a variety of work that the curriculum is broad and fundamental. Much of the work of mechanical engineers is concerned with both theoretical and applied aspects of power generation, mechanical design, manufacturing, environmental control, nuclear technology, engineering measurements and instrumentation, automatic controls, energy conversion devices, engineering materials, and the general area of aircraft, propulsion systems, and manned and unmanned space flight.

The mechanical engineering core of coursework serves as a strong base for any of the above interests. The technical elective subjects which complete the curriculum may be selected in such manner that a particular area of interest is enhanced.

MECHANICAL ENGINEERING CORE

ES 322	Mechanics of Solids	2
ES 372	Fluid Mechanics	3
MA 362	Advanced Mathematics for Engineers	3
or ME 308	Engineering Mathematical Analysis	(3)
or ES 366	Methods in Engineering Analysis	(3)
ME 331	Engineering Materials and Processes	3
ME 361	Measurement Engineering	3
ME 382	Thermodynamics	3
ES 421	Vibrations	3
ES 483	Heat Transfer	3
ME 441	Principles of Design	3

ME 445	Preliminary Design	3
ME 491	Experimental Mechanical Engineering	2
ME 492	Mechanical Engineering Projects	2
	Approved Option *Electives*	13

Mechanical engineering students may elect to specialize in one of the *elective* options, Aerospace, Nuclear, Design, Energy Conversion, Measurements and Controls, Engineering Materials, or in a general option. The courses required for these options are indicated below.

AEROSPACE—Required: ME 422; ME 452 or ME 453

Electives: Students may select a minimum of 7 additional semester hours from the following groups with a maximum of one course being selected from a group.

Group A: ME 443, ME 452, ME 453, IE 425
Group B: ES 423, ME 465
Group C: ME 450, ME 451, ME 455
Group D: ES 481, ME 411, ME 485, ME 487
Group E: EE 481, IE 472, ME 427

NUCLEAR—Required: ME 411; ME 413; ME 417

Electives: Students may select a minimum of 5 additional semester hours from the following groups with a maximum of one course being selected from a group.

Group A: ME 412 or CH 446

Group B: ME 414 or ME 415

DESIGN—Required: ME 321 or ME 322; ME 442; ME 465

Electives: Students may select a minimum of 5 additional semester hours from the following courses.

Group A: EE 326, EE 425, EE 481, ES 422, ES 423, ES 450, IE 375, IE 471, IE 472, ME 321, ME 322, ME 427, ME 432, ME 462, ME 487.

ENERGY CONVERSION—Required: ME 452, ME 484, ME 487

Electives: Students may select a minimum of 5 additional semester hours from the following courses.

Group A: EE 341, EE 362, EE 451, ES 481, ME 411, ME 413, ME 453, ME 455, ME 483, ME 485, ME 486.

MEASUREMENTS AND CONTROLS—Required: ME 462, ME 465, EE 302 or EE 332 or ES 423

Electives: Students may select a minimum of 5 additional semester hours from the following courses.

Group A: EE 302, EE 332, EE 341, EE 401, EE 425, EE 430, EE 432, EE 438, EE 481, ES 423, ME 422, ME 463.

ENGINEERING MATERIALS—Required: ES 450, ME 432, CH 441 or PH 361

Electives: Students may select a minimum of 5 additional semester hours from the following courses.

Group A: CH 442, EE 431, ME 411, ME 462, ME 463, ME 487

GENERAL OPTION

A minimum of 13 semester hours is required. The sequence of courses selected should have continuity and approval of the student's faculty adviser. This approval must be secured prior to enrollment. Normally courses should be selected from the above option groups, or from 300 level courses or above in engineering, the physical sciences, mathematics, business, or foreign languages.

DIVISION OF INDUSTRIAL DESIGN AND TECHNOLOGY

WALTER E. BURDETTE, Ed.D., Director

PURPOSE

The Division of Industrial Design and Technology serves several major functions. Important among these functions is the offering of a variety of four-year degree curriculums. These Bachelor of Science degree curriculums are designed to prepare senior technical support personnel who will assume roles as important members of the total technological team comprised of scientists, engineers, and other specialists.

The scope of emphasis in each curriculum is such as to prepare for supporting personnel in the major areas of research, development, and manufacturing. While comprehensive and foundational understanding of scientific principles is required, the essential nature of the task to be performed is in translation of the scientific ideas or discoveries into useful products and services. Consequently, these curriculums combine general foundations of scientific theory and facts with laboratory experiences which are designed to instruct in methods rather than to develop extensive skills.

Finally, it is the added purpose of these curriculums to make the student keenly aware of the urgent problems of society and to develop deeper appreciation of the cultural achievements of man.

The student may select that particular area of technology which conforms to his interests or his plans with respect to the kind of industry in which he pursues his career. For convenience, the fields of specialization are shown in the following list:

Aeronautical Technology
Communication Technology
Design Technology
Electronic Technology
Graphic Arts Technology
Tool and Manufacturing Technology
Welding Technology

A parallel function of the Division is the preparation of teachers of industrial arts education or technical subjects in the elementary and secondary schools and junior colleges.

Many educational leadership positions exist at these levels, as well as in technical institutes, colleges and universities, and in industry. Among these are the positions of technical teachers, department heads, supervisors or directors, consultants, and industrial training directors. Such opportunities require preparation beyond the undergraduate degree, and it is the purpose of the Division of Industrial Design and Technology to meet these needs through offerings leading to the completion of the Master of Arts in Education, the Education Specialist, and the Doctor of Education degrees with specialization in industrial education. (See Graduate Bulletin.)

ORGANIZATION

Fields of specialization in Technology have been organized around a core.

This technological core constitutes the common base of science, mathematics, graphics and technical communications. Similarly, industrial teacher education is organized about a common core.

Courses of instruction offered by the Division are organized under the following subject fields: aeronautical technology, communication technology, design technology, electronics technology, graphic arts technology, management, tool and manufacturing technology, welding technology, and industrial arts.

BACHELOR OF SCIENCE

Technology curriculums require the satisfactory completion of a minimum of 126 semester hours which includes general education courses, technical core courses, and both required and elective courses in the field of specialization. All male students must complete required credit in military or air science unless exempt. For more specific details regarding purposes of these curriculums, please refer to introductory material regarding "Purpose" of this Division on previous pages, as well as to the individual field of specialization materials which follow.

TECHNOLOGY CORE

1-MA	117	College Algebra	3
1-MA	118	Trigonometry	3
IA	109	Technical Problems	2
TD	111	Technical Drawing	2
1-PH	111	General Physics	4
1-CH	111	or	
1-CH	113	Elementary Chemistry	4
1-CH	114	or	
1-PH	112	General Physics	4
3-GB	101	Introduction to Business	3
TD	400	Technical Writing	3
			28

Beyond the requirements of General Education and the above core, the field of specialization requirements for the various technology curriculums are as follows:

AERONAUTICAL TECHNOLOGY

Instruction combines thorough technical training with a general university education to prepare aeronautical technicians for employment throughout the aero-space industry. The curriculum is designed to prepare Aeronautical Engineering Technologists with both theoretical and practical applications in the areas of structures, internal combustion engines and turbomachinery, fuels, lubricants, combustion, design, management, general and commercial aviation, and systems analysis.

Required Courses: TA 180, 181, 287, 288, 300, 306, 308, 310, 384, 388, 389, 390, 487, 488, 490, 498; TD 111, 112, 380; TM 161; WT 166; ME 230, 280; ME 330.

Electives: TA 182, 185, 307, 385, 486,; TD 340; ME 300, 301, 302, 332; MG 301; GB 305; IE 322, 439; IA 443; MA 120, 121, 212, 220.

Supporting Field. TE 200, 300; PH 112; EE 226.

COMMUNICATION TECHNOLOGY

The curriculum offers students preparation encompassing the four major areas of communication technology as follows: Technical library storage and retrieval science, graphic arts, technical writing, and technical editing and publishing.

The supporting studies in mathematics, science, business and technical work are planned to balance the preparation and provide the graduate with versatility in capitalizing on the very rapidly growing employment opportunities.

Required Courses: MC 110, 313, 340; GB 233, 431; EN 313, 341, 342.
Electives: EC 201; MG 301; AD 301; MC 211; ES 400.

Supporting Field: TD 121, 160, 260, 408, 498; GA 135, 334; TE 200; IE 200; EE 226.

DESIGN TECHNOLOGY

This program is designed to prepare technical support personnel who will contribute to the research and production progress of all design phases of engineering. The program has its foundation in mathematics, science, graphical language, and production standards with a built-in sustaining core to develop skills and knowledge in product design.

The program further provides opportunities to gain specialized knowledge in a particular related design area in which the student has special aptitudes or interest.

For convenience, the options offered in the Design Technology Program are:

Aeronautical Design
Civil Design
Electro-Mechanical Design
Industrial Design
Mechanical Design
Technical Design

Required Courses: TD 112, 121, 200, 302, 303, 340, 350, 408, 450, 451; ME 330.

Supporting Field: Courses chosen in a design option as approved by the adviser.

Electives: Chosen as appropriate to the design option selected.

ELECTRONIC TECHNOLOGY

Modern industry requires the support of three or more engineering technicians for each engineer. The four-year technical curriculum is designed to prepare an electronic-engineering technician. It provides theoretical and practical aspects with application techniques in the fields of computers, quality control, radar, microwaves, instrumentation, commercial broadcasting and television, and other activities associated with electronics.

Required Courses: TE 200, 213, 300, 301, 315, 330, 331, 340, 400, 412, 415; MA 120; PH 112.

Technical Electives: Select 12 hours from the following: TE 220, 320, 321, 328, 401, 418, 419, 430, 431, 440, 498; TD 112; MA 121, 212. Note: A minimum of 8 hours of the 12 selected must be upper-division courses.

Supporting Field: IA 160; TM 364; GB 301, 305; IE 435, 439; ME 230; MG 301, or suitable courses chosen with the approval of an adviser.

GRAPHIC ARTS TECHNOLOGY

This program is designed to provide broad professional education essential for a wide range of careers in the graphic arts industry. Among these are positions in administration and general management, production and quality control, sales and sales management, estimating, and research.

Required Courses: GA 135, 136, 235, 236, 237, 238, 333, 334, 336, 337, 338, 339, 435, 436g; IA 443; TE 200; ME 230; AR 141; MC 312.

Electives: GA 498; EC 202; IE 322, 439; MG 433; 451; MK 310, GB 301.
Supporting Field: GB 101, 305; MG 301; EC 201.

TOOL AND MANUFACTURING TECHNOLOGY

Increased technological complexity and sophistication have created great industrial demand for the services of men who possess working knowledge of the technical phases of production. Accordingly, this curriculum is intended to prepare students to meet the responsibilities of assisting in planning the processes of production, developing the tools and machines, and integrating the facilities of production or manufacture.

Required Courses: TM 161, 262, 363, 364, 366, 460, 461, 462, 463, 467, 468; IA 160, 461; WT 164, 364; ME 230; TE 200; ME 330; IE 322.

Electives: Chosen in a minor field as approved by the adviser.
Supporting Field: TD 111, 112, 121, 200, 305, 370, 371.

WELDING TECHNOLOGY

This program is designed to meet the established needs in industry for men trained specifically as supervisors or consultants in welding and related fields. Consequently, the curriculum offers opportunities for students to gain both theoretical and practical knowledge of the techniques and applications of the principal welding processes. Emphasis is placed on design, graphics, metallurgy, and manufacturing processes in metalworking industries.

Required Courses: WT 164, 166, 364, 369, 464, 466, 468, 469; TM 161, 262, 461, 467; IA 160; ME 230; ME 330; IE 322; TE 200.

Electives: Chosen in a minor field as approved by the adviser.

Supporting Field: TD 111, 112, 121, 200, 305, 370.

TWO YEAR TECHNICAL CURRICULUMS AND UNCLASSIFIED STUDENTS

Students not desiring to pursue a four-year degree program, but who wish to secure specialized preparation at the college level in industrial activities, may do so. Unclassified students are those who are not enrolled in any curriculum leading to a degree but who desire instruction in subjects of special interest to themselves. Moreover, a student may choose one of the two-year curriculums from a field of specialization. Specific courses included in the student program must have the approval of adviser.

INDUSTRIAL ARTS EDUCATION

The specific objective of this curriculum is to prepare students for the requirements of industrial arts teaching in the secondary schools. The carefully planned pattern of course work permits students to receive a balance and sequence of study. For the specific requirements of general and professional education, consult the catalog section of the College of Education.

MAJOR TEACHING FIELD

The major teaching field requires the satisfactory completion of 45 semester hours of which 19 hours are required laboratory courses, 11 hours are required in professional industrial arts courses, and 15 hours are elected with adviser approval from an area of specialization.

INDUSTRIAL ARTS CORE

TD	111	Technical Drawing	2
GA	135	General Graphic Arts	3
IA	121	Industrial Wood Processes	3
IA	160	General Metals	4
IA	170	Transportation and Power	2
IA	204	Design	2
IA	220	Electricity	3
IA	342	Selection of Subject Matter	3
IA	346	American Industries	2
IA	480	Teaching Industrial Subjects	3
IA		Professional Elective	3
			30
		Area of Specialization Electives	15
			45

Minor Teaching Areas Available

Industrial Arts
Electronics
Transportation and Power

Eighteen semester hours of work are required.

See minor adviser for approved course sequence.

DIVISION OF AGRICULTURE

DANIEL O. ROBINSON, Ph.D., Director

PURPOSE

The purpose of the Division of Agriculture is to prepare students to serve the agricultural industry at home and abroad. Fields of specialization are offered in Agricultural Science, Agricultural Production and Management, and Agricultural Business. The curriculum and courses offered are planned to meet the particular needs of the following students: (1) Those who are interested in preparing for careers in farm and ranch management; animal husbandry; crop production or horticulture; (2) Those desiring to prepare for a career in agricultural business; (3) Those desiring to prepare for a career in agricultural science; (4) Those desiring to prepare for foreign agricultural service; (5) Those who wish to take certain electives in agriculture while pursuing another curriculum; (6) Those who desire pre-forestry or pre-veterinary training, or preparatory courses for agricultural education.

ORGANIZATION

The Division of Agriculture is organized to provide four-year programs of instruction with fields of specialization in:

Agricultural Science
Agricultural Production and Management
Agricultural Business

Advisers in the three areas and special interest fields are available to assist students in program planning.

BACHELOR OF SCIENCE CURRICULUM IN AGRICULTURE

The completion of the four-year agricultural curriculum leads to the Bachelor of Science degree. A total of 126 semester hours of credit is required for graduation including general education and field of specialization requirements.

Students may choose one of the fields of specialization in Agricultural Science, Agricultural Production and Management, or Agricultural Business with areas of emphasis shown below. Special programs of studies are available for students who wish to prepare for foreign agricultural service, agricultural education, pre-veterinary, or pre-forestry.

FIELDS OF SPECIALIZATION

AGRICULTURAL SCIENCE

The field of specialization in Agricultural Science places emphasis on basic physical and biological sciences, economics, mathematics and the plant and animal sciences and is designed to prepare students for skilled professional work in these fields and service industries, and to prepare them for advanced studies in their field of interest. Areas of emphasis include Agricultural Economics, Animal Science, and Plant Science. Specialization requirements including General Education requirements are listed below. Specific courses will be selected by the student under the direction of his adviser.

AGRICULTURAL ECONOMICS

	Semester Hours
Courses in Agriculture	30
Courses in Economics, Business, Physical Sciences, Biological Sciences, and Mathematics	52
Elective and General Education Courses	44
	126

ANIMAL SCIENCE AND PLANT SCIENCE

	Semester Hours
Courses in Agriculture	30
Courses in Physical Sciences, Biological Sciences, and Mathematics	52
Elective and General Education Courses	44
	126

AGRICULTURAL PRODUCTION AND MANAGEMENT

The field of specialization in Agricultural Production and Management places emphasis on the technology of production and management and is designed to prepare students to become farmers, ranchers, farm managers, foremen, herdsmen, and for jobs with Government agencies and the technical phases of industry. Areas of emphasis include Farm and Ranch Management, Animal Husbandry, Crop Production, and Horticulture. Specialization requirements in addition to General Education requirements are listed below. Specific courses will be selected by the student under the direction of his adviser.

	Semester Hours
Courses in Agriculture	48
Supporting courses in Economics, Physical Sciences, Biological Sciences, and Mathematics	34
Elective and General Education Courses	44
	126

In addition to the academic requirements outlined above, students are required to demonstrate ability in the practical phases of production and husbandry related to their areas of emphasis. Students without adequate farm background can gain experience in farm practices at the University Farm, or on any farm that meets the approval of the adviser.

AGRICULTURAL BUSINESS

This field of specialization provides the agricultural student with the opportunity to combine a program in agriculture with courses in business and management. It is designed to prepare students for work in the agricultural industries concerned with handling, processing, and marketing farm products, and financing of farm production. It also prepares students for jobs in service industries involved in supplying equipment and materials used in agriculture. Agriculture courses may be selected for particular emphasis in plant industry, animal industry, or agricultural economics. Specialization requirements in addition to General Education requirements are listed below. Specific courses will be selected by the student under the direction of his adviser.

	Semester Hours
Courses in Agriculture	36
Courses in Economics and Business	35
Courses in Physical Sciences, Biological Sciences, and Mathematics	11
Elective and General Education Courses	44
	126

SPECIAL PROGRAMS

FOREIGN AGRICULTURAL SERVICE

This program of studies is available for students desiring preparation for agricultural work in foreign industries and developing countries of the world. The objective is to give the student an opportunity to become better acquainted with the physical and cultural environment in which he plans to work. Under the guidance of his adviser, the student may select elective and general education courses to give a unified area of study concerned with the physical and cultural geography of a region, as well as the government, history, language, religion, philosophy, and esthetic values of the people.

Whenever feasible, applied work in agriculture, business, and the social sciences will be conducted with American Indian people who have similar problems of underdeveloped resources and talents.

Area study courses should be selected from the following:

Subject Field	Semester Hours
Geography	6
History	6
Foreign Language	8
Sociology and Anthropology	9
Philosophy and Art	8
Political Science	3
Psychology	3
	43

AGRICULTURAL EDUCATION

The first two years of the curriculum preparing students to teach vocational agriculture in the high school is offered as a special program. Students should consult their advisers and select their courses to meet the requirements of the college from which they plan to obtain their agriculture education degree.

PRE-VETERINARY AND PRE-FORESTRY

The requirements for the first two years of courses in forestry and veterinary work vary considerably in the different colleges offering these programs. The student is advised to obtain a copy of the catalog from the school he plans to attend and select his program accordingly. The following course of study will meet most of the requirements if the student carefully selects electives to meet the requirements of the college that he plans to attend.

PRE-VETERINARY

FIRST YEAR

First Semester	Hours	Second Semester	Hours
EN- 101 First Year English	3	EN 102 First Year English	3
ZO 100 General Zoology	4	BO 100 General Botany	4
CH 113 General Chemistry	4	CH 115 Gen. Chem. and Qual. Analysis	5
MA 117 College Algebra	3	MA 118 Trigonometry	3
PE 101 Freshman Phys. Ed	0.5	PE 102 Freshman Phys. Ed	0.5
MS 101 Basic Military Science or AS 101 Basic Aerospace		MS 102 Basic Military Science or AS 102 Basic Aerospace	
	———		———

SECOND YEAR

First Semester	Hours	Second Semester	Hours
PH 111 General Physics	4	PH 112 General Physics	4
CH 331 General Organic Chemistry	4	CH 225 Quantitative Analysis	4
ZO 271 Chordate Anatomy	4	CH 332 General Organic Chemistry	4
MS 201 Basic Military Science or AS 201 Basic Aerospace		MS 202 Basic Military Science or AS 202 Basic Aerospace	
Electives	4	Electives	4
	———		———

SPECIAL PROGRAMS

PRE-FORESTRY

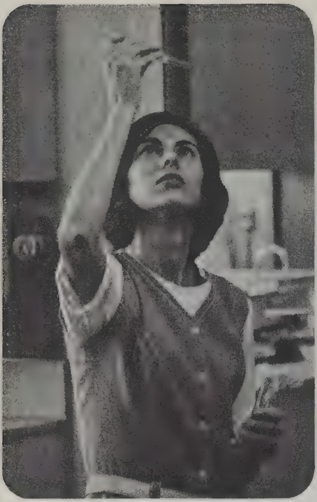
FIRST YEAR

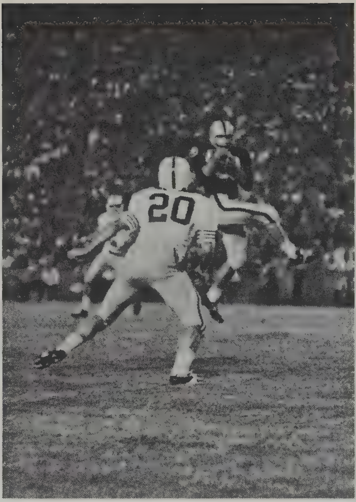
First Semester	Hours	Second Semester	Hours
EN 101 First Year English	3	EN 102 First Year English	3
BO 100 General Botany	4	CH 115 Gen. Chem. and Qualitative Analysis	5
MA 117 College Algebra	3	MA 118 Trigonometry	3
CH 113 General Chemistry	4	ZO 100 General Zoology	4
PE 101 Freshman Phys. Ed.	0.5	PE 102 Freshman Phys. Ed.	0.5
MS 101 Basic Military Science or AS 101 Basic Aerospace		MS 102 Basic Military Science or AS 102 Basic Aerospace	
	———		———

SECOND YEAR

First Semester	Hours	Second Semester	Hours
PH 111 General Physics	4	PH 112 General Physics	4
GL 113 Physical Geology	4	CE 241 Surveying	3
AG 232 Soils	3	BO 280 Plant Pathology	4
BO 250 Plant Anatomy	4	AG 248 Conservation of Ag. Resources	3
MS 201 Basic Military Science or AS 201 Basic Aerospace		MS 202 Basic Military Science or AS 202 Basic Aerospace	
		Electives	2
	———		———

West entrance of the popular Memorial Union.





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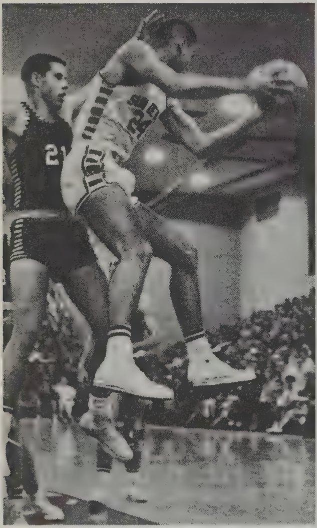

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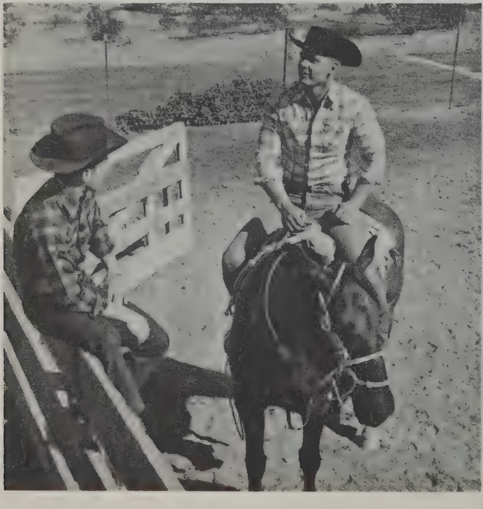

COLLEGE OF ARCHITECTURE

JAMES W. ELMORE, M.S. in Arch., DEAN

PURPOSE

The College of Architecture offers degree programs and special courses with the purpose of providing liberal, technical and professional preparation for careers concerned with creation of the buildings and related features of a functional and satisfying environment.

ORGANIZATION

The courses of instruction are organized as follows:

Architecture—5-year curriculum leading to the degree of Bachelor of Architecture.

Construction—4-year curriculum leading to the degree of Bachelor of Science.

ADMISSION

Students who wish to be admitted to full freshman standing in the College of Architecture should present certain secondary school units in addition to the minimum University requirements shown on page 56. Mathematics must include algebra, advanced algebra and geometry for a total of 2½ units with grades of "C" or better. Laboratory sciences must include one unit of physics and one unit of chemistry. Other units should include additional math, art and social sciences.

Student Qualification Record on forms furnished by the College of Architecture must be completed and returned directly to the Dean at the time of application to the Director of Admissions. Aptitude tests for both architecture and construction are administered on campus in the spring and fall on specific dates announced separately. These serve as counseling aids and should be taken as early as possible. High school seniors may have transcripts furnished by their high schools complete except for their final semester with supplementary report to be filed following graduation. Students are encouraged to complete all application requirements prior to June 30.

For architecture students, the number that can be accommodated in the design studios is limited by the availability of physical space and resources. Scholastic achievement is an important factor in identifying those to be admitted to the five-year-long Design Sequence leading to the Bachelor of Architecture degree. Scholastic achievement is measured by high school grades and rank in high school graduating class, scores in standard tests and grades at other collegiate institutions. Entering students not accommodated in the first course of the Design Sequence (AC 121) may re-apply to the Dean for later accommodation. Transfer and former students seeking admission at any level higher than first year must submit representative examples of their achievement in drawing and design directly to the Dean. For such students, aptitude tests may be waived.

BACHELOR OF ARCHITECTURE DEGREE PROGRAM

It is the purpose of the program in architecture to provide graduates with:

— a thorough and intimate comprehension of the nature of architecture
— the competence necessary to acquire professional registration
— the high ideals necessary for responsible and creative functioning as an individual and as an architect in our society.

The program is accredited by the National Architectural Accrediting Board and provides educational qualification for registration under Arizona law as administered by the State Board of Technical Registration in conformity with the recommendations of the National Council of Architectural Registration Boards. The College is a member of the Association of Collegiate Schools of Architecture. An Advisory Committee of six architects practicing locally and in neighboring states gives counsel in shaping policies of the College. The Central Arizona Chapter of the American Institute of Architects lends support in many ways including award of scholarships and sponsorship of the Student Chapter of the American Institute of Architects.

During the first two years the student pursues studies of two kinds: those looking to his development as an individual and those exploring his potential as an architect. In the last three years the courses are essentially concerned with professional work.

CURRICULUM FOR THE BACHELOR OF ARCHITECTURE DEGREE

Students seeking the Bachelor of Architecture degree must satisfactorily complete a curriculum of 170 hours (plus ROTC if required) as summarized below:

Sem. Hrs.

Courses in General Education provide a broadening and enrichment of the student's outlook and a preparation for the technical and professional content of the program to follow. These courses are in:

	Sem. Hrs.
Communications: English, EN 101, 102; Speech SE 100	8
Humanities: Electives	8
Social Sciences: History, HI 101, 102; Anthropology, AN 111	9
Sciences: Physics, PH 101; Geography, GE 411	7
Mathematics: MA 141, 241	7
Physical Education and Health	1
Total	40

Studies in Architectural Techniques develop *knowledge* of the technical bases of architecture. These studies are concerned with *ways* of doing things. The course sequences are:

	Sem. Hrs.
Landscape Architecture: AC 337, 338	4
Planning and Urban Design: AC 332, 433	5
Delineation: AC 241, 242	4
Construction, Drawing and Specifications: AC 251, 252, 353, 456	8
Structures: AC 260, 261, 362, 363, 464, 465	18
Mechanical and Electrical Systems: AC 471, 472	6
Professional Practice: AC 482	3
Total	48

Studies in Architectural Philosophies develop understanding of architecture as both a consequence and a determinant of man's character—in the past (history) and at present (theory). These studies are concerned with *reasons* for doing things. The course sequences are:

Introduction and Fundamentals: AC 100, 101	4
Historical Architecture: AC 311, 312	6
Modern Architecture: AC 413, 414	6
Contemporary Architecture Seminar: AC 415	2
Total	18

Work in Architectural Design develops the student's capacity for synthesis of his knowledge and understanding in the solution of specific architectural problems. The course sequences are:

Design: AC 121, 122, 223, 224, 320, 325, 326, 427, 428, 429	42
Thesis Research and Thesis: AC 494, 495	13
Total	55

Elective courses enable the student to fortify weaknesses, exploit strengths and pursue special interests in disciplines related to architecture.

Electives	9
Total of normal 10-semester curriculum	170

The recommendation of the design critic is required for advancement from one design course to the next—generally a student with a grade of "C" or better will be promoted. A student at any level who has a cumulative index of less than 2.00 ("C" average) in all courses will be advanced or retained in the program only on recommendation of the College Admissions and Standards Committee.

The student must furnish two bound copies of his thesis research to the architecture library. Work done in satisfaction of degree requirements becomes the property of the College.

BACHELOR OF SCIENCE DEGREE PROGRAM IN CONSTRUCTION

The four-year Bachelor of Science Degree in Construction described herein became an operational program in 1957. It has evolved from fundamental architectural, business, construction, and engineering curricula with the counsel of an advisory committee composed of twelve representatives of various segments of the construction industry who assist in shaping the program and policies so as to provide realistic instruction in the techniques and philosophies of the contracting profession.

The basic curriculum provides for the student's balanced development in each of three primary educational areas with a fourth, optional area of limited specialization available to accommodate individual students with varying backgrounds and interests who wish to concentrate in any one or an approved combination of the following major construction fields:

Elective Field of Construction

Building Construction
Industrial Construction
Heavy Construction
Construction Administration

Decisions regarding the individual student's program will be reached by the student in close consultation with his faculty adviser.

Students seeking the Bachelor of Science Degree in Construction must satisfactorily complete a curriculum of 132 semester hours (plus ROTC if required) as summarized below:

General Education Courses furnish a broad base for developing understanding of the modern world and the relation of construction to it.

	Sem. Hrs.
Communications: English, EN 101, 102; Speech, SE 100; Technical Communications, ES 400	11
Humanities: Intro. to Architecture, AC 100 and electives	8
Behavioral and Social Sciences: Principles of Economics, EC 201, 202, and electives	8-9
Science and Mathematics: Physics, PH 111, 112; or Chemistry 113 and 114; or PH 101 and CH 111; Mathematics, MA 141, 241	15
Physical Education and Health: PE 101, 102	1
Foreign Language or other General Education electives	0-6
Total	43-50

Technical courses offered in both the Colleges of Architecture and Engineering Sciences provide knowledge of buildings and structures, the materials of construction and the techniques, systems, and procedures related to engineering, architecture and construction.

Construction Drawing: CO 113	3
Materials of Construction: CO 243, CE 311	4
Design and Engineering: CO 126, 221, 244, 323, 324, CE 380, 401, CO 425, CE 450	22
Machinery and Equipment: CO 251, 352	4
Surveying: CE 241, 344	6
Total	39

Business and Construction Management courses offered in the Colleges of Architecture, Business Administration, and Engineering Sciences furnish an understanding of fundamental principles of organization, control and direction of the business affairs of contracting.

Organization, Supervision, Administration: CO 101, MG 301, IE 439, CO 496	10
Engineering Economy: IE 311	2
Construction Estimating: CO 383, 384	6
Planning, Scheduling, Construction Methods: CO 461, 462, 491	8
Accounting: 3AC 101, CO 381	6
Law: IE 335, or GB 305, 306	2-6
Total	34-38

Optional Field of Construction: Elective courses provide the construction student a practical means of reinforcing his general education and his professional preparation in any one of several divisions of the business of contracting. Study is to be selectively directed into such essential subject areas as: Construction estimating and methods, real estate and finance, general engineering, building technology, architecture, supervision and management, language and communications, costs and accounting.

Total of electives	16-5
Total of normal eight-semester curriculum	132

Upon successful completion of 12 hours Advanced ROTC, students may petition for up to 6 hours maximum as technical elective credit.

University Bookstore offers variety of reading material.

Students gather around fish pond at Old Main.

COLLEGE OF NURSING

LORETTA HANNER, M.S., DEAN

PURPOSE

The purpose of this program, which leads to a Bachelor of Science in Nursing degree, is to prepare students for beginning professional nursing positions under supervision in Psychiatric, Maternal and Child, Medical and Surgical, and Public Health Nursing; and to provide a foundation for further specialization in clinical nursing, supervision, administration and teaching.

PHILOSOPHY

The College of Nursing contributes to the improvement of society through the preparation of competent professional nurses.

The College of Nursing believes that the professional nurse is one who is able not only to give comprehensive nursing care in the hospital, home or community agency, but is also able to function as a participating member of professional and citizen's groups engaged in the promotion of health, prevention of disease and care of the sick. The professional nurse also contributes to nursing research, upholds the ideals of the nursing profession, works toward its continued improvement and growth, and interprets her profession to society.

The College of Nursing believes that courses in the humanities and the social, behavioral, physical and biological sciences are an integral part of the curriculum, contributing to the student's depth and breadth of understanding.

The College of Nursing believes that there must be recognition of the individual student's level of development and needs in order that there may be the selection of learning experiences necessary for optimum personal and professional growth.

OBJECTIVES

The objectives of the College of Nursing are to assist the student to:

1. Develop the knowledge, appreciations, attitudes, and skills which enable a nurse to function effectively as a member of the health team in meeting the physical, social, psychological, spiritual, and health educational needs of the patient, family, and community.
2. Understand the common phenomena of one's physical environment, to apply habits of scientific thought to personal, professional, and civic problems, to appreciate the implications of scientific discoveries for human welfare, and to apply scientific principles in the promotion of health.
3. Acquire and use the skills and habits involved in critical and constructive thinking.
4. Understand the ideas of others and to express one's own effectively.
5. Participate actively as an informed and responsible member of the nursing profession in solving professional problems.
6. Develop as a reasonable and creative citizen of the local, state, and international community.

ACCREDITATION

The program of the College of Nursing has been approved by the Arizona State Board of Nursing and the National League for Nursing. The College is a member of the Council of Member Agencies for the Baccalaureate and Higher Degree Programs of the National League for Nursing and the Western Council on Higher Education for Nursing. The College is approved by the Army Nurse Corps and the Navy Nurse Corps, so that qualified students may apply for the Army Student Nurse and the Navy Student Nurse programs.

GENERAL INFORMATION

SCHOLARSHIPS

For information regarding scholarships and loans, see page 87. Information about other loan funds for student nurses may be obtained from the Dean of the College of Nursing.

STUDENT HEALTH

In addition to the health policies of the University, the nursing student is responsible for having an annual physical examination. Each spring students will be supplied with physical examination forms. The physical examination must be completed during the summer and the reports returned to the College of Nursing before fall semester begins. The nursing student will also be required to have an annual chest X-ray or tuberculin test at Student Health Service. Those students whose diptheria, tetanus, polio, and smallpox immunizations are not current will be required to start these series during fall semester of the sophomore year.

STUDENT ACTIVITIES

The nursing student is a member of the general student body of the University and selects and participates in those campus activities which are of interest to her.

Students of the College of Nursing are eligible for membership in the Student Senate of A.S.A.S.U., Arizona Association of Student Nurses and the National Student Nurse Association.

ACADEMIC STANDING

A student must maintain a cumulative index of 2.00 and achieve a minimum grade of "C" in all nursing courses in order to remain in the nursing program. Students who may have deficiencies in subject matter preparation may be required to complete additional university credit coursework.

Well-prepared beginning students can usually complete the plan of study leading to the degree of Bachelor of Science in Nursing in four years. In general, the curriculum for registered nurses will require three academic years of full-time study for completion of the program. Many students, however, may find it advantageous or necessary to devote more than these minimum times to the undergraduate nursing program of study by pursuing at one time, in any semester, fewer studies than are regularly prescribed. In cases of inadequate secondary preparation, or financial necessity requiring much time for outside work, the time for the undergraduate course should be extended. A student who so desires may devote an increased length of time to his undergraduate work and include additional instruction in the liberal arts.

BACHELOR OF SCIENCE IN NURSING

The Bachelor of Science in Nursing is granted upon completion of 128 semester hours. The nursing program consists of completing the general education requirements of Arizona State University and the major in nursing. Requirements include communications, humanities, behavioral and social sciences, sciences and mathematics, and physical education and health; selected courses from the physical, biological, social and behavioral sciences; and maternal and child, medical and surgical, psychiatric and public health nursing. The nursing major begins in the sophomore year.

Prior to enrolling in the clinical nursing specialty areas in the sophomore year, each nursing student must (a) receive approval from the office of the Dean of the College of Nursing and (b) secure from his or her adviser an approved course of study for the remaining work. Generally, students with an aptitude for nursing, desirable personal qualifications, sound physical and mental health and a 2.00 scholarship index ("C" average) or higher will receive approval for entering into the program of the College of Nursing. Continuing in the program is dependent upon maintaining the above qualifications, and achieving a minimum grade of "C" in every nursing course.

The College of Nursing is located in close proximity to those hospitals and health agencies used for student clinical experience throughout the program. Community agencies cooperating with the College of Nursing include: Good Samaritan Hospital, Arizona State Hospital, Crippled Children's Hospital, Maricopa County General Hospital, Maricopa County Health Department, Visiting Nurse Service, Inc., Samuel Gompers Rehabilitation Center, Veterans Administration Hospital, Memorial Hospital, Doctor's Hospital, St. Luke's Hospital, White Angel Hospital, St. Joseph's Hospital, Arizona State Tuberculosis Sanatorium, Kivel Nursing Home, and Crestview Convalescent Lodge, and other health centers in the Phoenix area.

REQUIREMENTS FOR ADMISSION

The program is designed to meet the needs of: (1) freshman students with no prior nursing education, (2) transfer students from other programs within the University or from other educational institutions, and (3) registered nurse students.

I. Freshman students must meet University standards and follow the procedure as stated in the Admissions section of this catalog. It is recommended that the high school program of the students wishing to register in nursing should include at least four units of English, two units of history and government, two units of algebra, three units of science (chemistry, physics, biology) and two units of foreign language.

II. Transfer students must have a cumulative 2.00 index ("C" average), follow procedure for admission to the University stated on page 57 and, if transferring from another educational institution, also request the college to send a transcript to the Dean, College of Nursing. Transfer credits which are accepted by the Registrar will be evaluated by the College of Nursing Standards Committee to determine their application toward fulfilling the requirements of the nursing major.

III. Registered nurse students must follow the procedure for admission to the University stated in the Admissions section of this catalog and complete the following requirements:

A. Request their school of nursing and/or college to send two transcripts of their school of nursing work and/or previous college work, one directly to the Registrar and Director of Admissions and one to the Dean, College of Nursing. These must be in the office of the Registrar and Director of Admissions at least thirty days in advance of the registration date. These are required in addition to high school transcripts, as stated in the catalog. Credit for comparable nursing courses, taken previously at another university, will be determined on the basis of recency and content of course.

B. Request that a letter confirming the applicant's active registered nurse status be sent to the Registrar and Director of Admissions by any State Nurse Licensure Board where the applicant is currently registered and in active standing.

C. The Admissions Office will notify the applicant of acceptance to the University and of the tentative number of advanced standing credit hours which may be granted for the prior school of nursing program.

D. Advanced standing for completed clinical nursing courses will be granted subject to the following procedures:

1. Make an appointment for an interview by calling the College of Nursing. At this time the applicant should present the evaluation of her advanced standing sent to her by the Director of Admissions.

2. Take the Graduate Nurse Examination and achieve satisfactorily in all areas tested and/or make up any deficiencies before enrolling in senior nursing courses.

    a. Part-time students will be allowed additional time to complete the above procedure. The amount of additional time allowed will depend upon the time the student will require to become eligible for senior standing.

    b. Full-time students must begin to make up any deficiencies within one year following admission to the College of Nursing.

    c. Deficiencies should be made up in the following sequence:
        (1) Psychiatric Nursing
        (2) Maternal-Child Nursing
        (3) Medical-Surgical Nursing

3. Have the approval of the Dean, College of Nursing. This approval will be granted upon the recommendation of the Standards Committee after an individual evaluation of credentials, abilities, and personal qualifications. The College of Nursing Standards Committee will accomplish this review after the student has completed satisfactorily 15 semester credit hours in residence at Arizona State University.

COLLEGE OF FINE ARTS

HENRY A. BRUINSMA, Ph.D., DEAN

PURPOSE

The College of Fine Arts, approved by the Board of Regents on October 3, 1964, functions within the general framework and philosophy of the University. In addition to providing services and courses in the General Education program of the University, the College seeks to provide for properly qualified students thorough professional training in one of the several arts against a broad background of courses designed to prepare the student for the responsible citizenship which the University seeks as the product of all its programs.

ORGANIZATION

The College, through its constituent departments of Art, Music, and Speech and Drama, reflects in its programs the wide range of challenges which face the communicative artist in the twentieth century. Because of its location on a campus with many strong supportive departments, the College is able to ensure that each student secures the philosophical foundation for his art, strengthened by the other scientific, psychological, sociological, and humanistic disciplines fundamental to the forming of the contemporary creative artist.

In addition to the professional curricula offered by each department of the College, close ties are maintained with the College of Liberal Arts and with the College of Education through courses and curricula designed to meet the educational goals of those Colleges. The College of Fine Arts also enriches the life of the University community through its extension and laboratory offerings with an intensive series of art exhibitions, concerts and recitals, dramas, musical theatre, lectures, and various diagnostic and clinical services.

BACHELOR'S DEGREES

The College of Fine Arts offers work leading to four bachelor's degrees: the Bachelor of Fine Arts; the Bachelor of Science with majors in Art and Speech Correction; the Bachelor of Music; and the Bachelor of Arts with majors in art, music, speech, or drama. The Bachelor of Arts degree with a major in art, music, speech or drama may also be elected in the College of Liberal Arts. In cooperation with the College of Education, each department of the College of Fine Arts also offers major programs designed to provide teachers of art, music, speech and drama for the public schools, leading to the Bachelor of Arts in Education degree.

MASTER'S DEGREES

A graduate program consisting of a minimum of 30 semester hours of approved work in a special field of study leads to master's degrees in the following fields:

Degree	Fields of Specialization
Master of Fine Arts	Design, Drawing and Painting, Sculpture, Graphics, Ceramics, Photography

Master of Music	Applied Music, Theory, Composition
Master of Arts	General Speech and Drama, Rhetoric and Public Address, Drama, Art History, Music History,
Master of Science	Speech and Hearing Therapy
Master of Arts in Education	Art Education, Music Education, Speech, Dramatics

DOCTOR OF EDUCATION DEGREE

In cooperation with the College of Education, the Department of Art and the Department of Music offer special curricula leading to the Doctor of Education degree with majors in Art Education or Music Education.

HONORS PROGRAM

The Honors Program in the College of Fine Arts is intended for the outstandingly competent student whose interests and specific curriculum indicate that definite advantages may accrue from a program emphasizing individual study. For a general description of Honors work, see page 76 of this catalog.

BACHELOR OF ARTS

The curriculum for the degree of Bachelor of Arts is designed to give the student a broad, general background in the principal fields of human knowledge and a reasonable amount of specialized training in a selected area. This degree is offered in the Departments of Art, Music, and Speech and Drama, may be pursued either in the College of Fine Arts or in the College of Liberal Arts. In either case, the adviser for the student will be the same. Majors are offered in Art, Music, Speech, and Drama.

GENERAL EDUCATION REQUIREMENTS

The general education program consists of 40 semester hours of approved courses, to be selected by the adviser in consultation with the student from among those approved courses listed on pages 72-75 of the catalog. In category IV, Sciences and Mathematics, the student must take at least one course in a laboratory science.

MAJOR REQUIREMENTS

A major shall consist of 45 semester hours of credit. Not more than 30 semester hours may be in a single subject field and at least 15 must be in one or more different but related subject fields. The content of the major is determined by the adviser in consultation with the student under the rules and regulations of the department concerned. At least 18 semester hours must be in upper division courses. For specific major requirements see statements under each department in the catalog section "Courses of Instruction."

ADDITIONAL DEGREE REQUIREMENTS

1. Knowledge in *one* foreign language equivalent to the level obtained through 16 hours of instruction in elementary and intermediate courses on the college level. This requirement may be

fulfilled in whole or in part through language instruction in secondary schools or by other means. If acquired in secondary school, two years of instruction in *one* foreign language will be considered the equivalent of one year of instruction on the college level. A student who desires to fulfill the entire requirement through 4 years of study in *one* foreign language in secondary schools, or in other non-collegiate institutions, must pass a proficiency examination given by the Department of Foreign Languages in satisfaction of the total requirement. Students who transfer from other colleges with less than two years of credit in a foreign language will be placed in a course at the next level above the work completed.

2. All candidates for graduation in the Bachelor of Arts degree curriculum are required to present at least 50 hours of upper division courses.
3. A cumulative scholarship index of 2.00 is required for graduation and no credit will be granted toward fulfilling major requirements in any upper division course in the student's major unless the grade in that course is at least a "C".
4. All students, except those who receive a grade of "B" or better in EN 102, or who were exempt from that course, or who passed EN 104, shall, before the end of their sophomore year, take and pass a written English Proficiency Examination. Failure to take this examination at the proper time or failure to pass it will make them ineligible to take upper division courses. This ineligibility will continue until such time as they pass a subsequent examination.
5. At least 60 hours, *not including the major,* must be taken in the following areas:

   All courses in Anthropology, Art History, Biology, Botany, Drama, Economics, Educational Psychology, English, Entomology, Foreign Languages, History, Humanities, Mathematics, Microbiology, Philosophy, Physics, Political Science, Psychology, Social Foundations (Education), Sociology, and Zoology.

   In the following areas, all courses *except* those specifically listed may be counted toward the fulfillment of this requirement: Chemistry, all courses except CH 300; Geography, all courses except GE 211 and 341; Geology, all courses except GL 215, 319, and 460; Health Education, all courses except HE 461; Home Economics, all courses except HO 123, 142, 321, 341, 343, 422, 423, 431, 457, and 480; Journalism, all courses except MC 211, 212, 311, 313, 315, 320, 411, and 413; Music, all courses except those in Music Performance and MU 311, 312, 461, and 480; Speech, all courses except SE 214, 315, and 316.

   In the following areas, only those courses listed may be taken for credit for the fulfillment of this requirement: Architecture, AC 100, 301, 311, 312, 317, 413, 414; General Physical Sciences, PL 110, 121, 321, 361, 362, and 410; Physical Education, PE 280, 385 and 386.

BACHELOR OF SCIENCE

The curriculum for the degree of Bachelor of Science with majors in Art and Speech Correction is designed to give the student a broad general background in the principal fields of human knowledge and an opportunity to specialize in one specific selected area.

GENERAL EDUCATION REQUIREMENTS

40 semester hours (See page 72-75).

In category IV, Sciences and Mathematics, the student must elect at least one course in the physical sciences, one course in the life sciences, and one course in mathematics. One of these courses must be a laboratory science.

MAJOR REQUIREMENTS

A major shall consist of from 45 to 55 semester hours of credit. The content of the major is determined by the adviser in consultation with the student under the rules and regulations of the department concerned. At least 40 per cent of the major must be in upper division courses. For specific major requirements see the statement under these Departments in the catalog section "Courses of Instruction."

ADDITIONAL DEGREE REQUIREMENTS

1. All candidates for graduation with the Bachelor of Science degree curriculum are required to present at least 50 hours of upper division courses.
2. A cumulative scholarship index of 2.00 is required for graduation and no credit will be granted toward fulfilling major requirements in any upper division course in the student's major unless the grade in that course is at least a "C".
3. All students, except those who receive a grade of "B" or better in EN 102, or who were exempt from that course, or who passed EN 104, shall, before the end of their sophomore year, take and pass a written English Proficiency Examination. Failure to take this examination at the proper time or failure to pass it will make them ineligible to take upper division courses. This ineligibility will continue until such time as they pass a subsequent examination.
4. At least 60 hours, not including the major, must be taken in the following areas:
   All courses in Anthropology, Art History, Biology, Botany, Drama, Economics, Educational Psychology, English, Entomology, Foreign Languages, History, Humanities, Mathematics, Microbiology, Philosophy, Physics, Political Science, Psychology, Social Foundations (Education), Sociology, and Zoology.

   In the following areas, all courses except those specifically listed may be counted toward the fulfillment of this requirement: Chemistry, all courses except CH 300; Geography, all courses except GE 211 and 341; Geology, all courses except GL 215, 319, and 460; Health Education, all courses except HE 461; Home Economics, all courses except HO 123, 142, 321, 341, 343, 422, 423, 431, 457, and 480; Journalism, all courses except MC 211, 212, 311, 313, 315, 320, 411, and 413; Music, all courses except those in Music Performance and MU 311, 312, 461, and 480; Speech, all courses except SE 214, 315, and 316.

   In the following areas, only those courses listed may be taken for credit for the fulfillment of this requirement: Architecture, AC 100, 301, 311, 312, 317, 413, 414; General Physical Sciences, PL 110, 121, 321, 361, 362, and 410; Physical Education, PE 280, 385 and 386.

BACHELOR OF FINE ARTS

The curriculum for the degree of Bachelor of Fine Arts is designed to meet the needs of the student with specific professional interest in creative performance in one or more of the specialized fields of art. The total program will consist of 132 hours of credit, divided as follows:

GENERAL EDUCATION REQUIREMENTS

The general education program consists of 40 semester hours of approved courses, to be selected by the adviser in consultation with the student from among those approved courses listed on pages 72-75 of the catalog. In category IV, Sciences and Mathematics, the student must take at least one course in a laboratory science.

In category VI (General Education electives) the 9 semester hours may consist entirely of courses in Art History.

MAJOR REQUIREMENTS

A major shall consist of 76 semester hours of credit divided as follows:

CORE CURRICULUM

The level of courses in the core curriculum will be determined by the adviser in consultation with the student and will be based upon the student's aptitudes, needs, and previous level of training. The core curriculum shall include the following areas of study:

Basic Design	6 sem. hrs.
Drawing	5 sem. hrs.
Painting	3 sem. hrs.
Sculpture	3 sem. hrs.
Ceramics or Crafts	3 sem. hrs.
Photography	3 sem. hrs.
Art History (AH 211, 212, 313)	12 sem. hrs.
Aesthetics	2 sem. hrs.
Total	37 sem. hrs.

AREA OF SPECIALIZATION

The area of specialization shall be determined by the student on the basis of his interests and professional intentions and shall consist of 39 hours of course work selected by the student in consultation with his adviser. A minimum of 12 credit hours of courses numbered 300 or 400 in one specific creative field must be included within the area of specialization. The student, in consultation with his adviser, may select applicable courses from other departments or colleges when it is felt they will make a specific contribution to his program of study. The following areas of specialization are available to the student: Painting, sculpture, graphics, design, ceramics-crafts, commercial art, and environmental design.

ELECTIVES

In addition to the general education and major requirements, the student, in consultation with his adviser, will complete 16 semester hours of electives chosen from among the course offerings of any department of the University other than that of the Department of Art. These electives should normally be selected in order to supplement or complement the area of specialization. (ROTC will be included within this requirement.)

ADDITIONAL DEGREE REQUIREMENTS

1. All candidates for graduation in the Bachelor of Fine Arts degree curriculum are required to present at least 50 hours of upper division courses.
2. A cumulative scholarship index of 2.00 is required for graduation and no credit will be granted toward fulfilling major requirements in any upper division course in the student's major unless the grade in that course is at least a "C".
3. All students, except those who receive a grade of "B" or better in EN 102, or who were exempt from that course, or who passed EN 104, shall, before the end of their sophomore year, take and pass a written English Proficiency Examination. Failure to take this examination at the proper time or failure to pass it will make them ineligible to take upper division courses. This ineligibility will continue until such time as they pass a subsequent examination.

BACHELOR OF MUSIC

The curriculum for the degree of Bachelor of Music is designed to give the student a broad general background in the principal fields of human knowledge, and training of a professional caliber in musical performance, music theory, composition, and sacred music.

Placement tests in theory, piano, and a major performing medium are required of all freshman and transfer students.

The curriculum is divided into three parts:

GENERAL EDUCATION REQUIREMENTS

40 semester hours (see pages 72-75).

MAJOR REQUIREMENTS

A major shall consist of 84 semester hours of credit in music. The content of the major is determined by the adviser in consultation with the student under the rules and regulations of the Music Department. Majors are offered in applied music, theory and composition, and sacred music.

ADDITIONAL DEGREE REQUIREMENTS

1. Knowledge in *one* foreign language equivalent to the level obtained through 16 hours of instruction in Elementary and Intermediate courses on the college level. This requirement may be fulfilled in whole or in part through language instruction in secondary schools or by other means. If acquired in secondary school, two years of instruction in *one* foreign language will be considered the equivalent of one year of instruction on the college level. A student who desires to fulfill the entire requirement through 4 years of study in *one* foreign language in secondary schools, or in other non-collegiate institutions, must pass a proficiency examination given by the Department of Foreign Languages in satisfaction of the total requirement. Students who transfer from other colleges with less than two years of credit in a foreign language will be placed in a course at the next level above the work completed.

2. All candidates for graduation in the Bachelor of Music degree curriculum are required to present at least 50 hours of upper division courses.
3. A cumulative scholarship index of 2.00 is required for graduation and no credit will be granted toward fulfilling major requirements in any upper division course in the student's major unless the grade in that course is at least a "C".
4. All students, except those who receive a grade of "B" or better in EN 102, or who were exempt from that course, or who passed EN 104, shall, before the end of their sophomore year, take and pass a written English Proficiency Examination. Failure to take this examination at the proper time or failure to pass it will make them ineligible to take upper division courses. This ineligibility will continue until such time as they pass a subsequent examination.
5. All students majoring in music are required to attend 25 approved recitals as set up by the faculty during the school year as partial fulfillment of the course requirements in their major performing field.

The Department of Music is a member of the National Association of Schools of Music, and the requirements for entrance and graduation set forth in this catalog are in accordance with the published regulations of that association.

BACHELOR OF ARTS IN EDUCATION

Students wishing to prepare for careers as teachers of Art, Music, or Speech and Drama in the public schools will enroll in the Bachelor of Arts in Education curriculum through the College of Education. Specific requirements for these programs are found on page 154 of this catalog.

University Library will have million volume capacity.

COLLEGE OF LAW

The College of Law of Arizona State University was established by vote of the Board of Regents of the Universities and State College of Arizona, October 3, 1964.

The College of Law will offer programs of study leading to professional graduate degrees in law. It is anticipated that the College will enroll its first students in the fall semester, 1967.

Inquiries regarding the College should be addressed to the Office of the Dean, College of Law, Arizona State University, Tempe, Arizona.

GRADUATE SCHOOL OF SOCIAL SERVICE ADMINISTRATION

HORACE W. LUNDBERG, Ph.D., Dean

PURPOSE

The Graduate School of Social Service Administration offers a two-year generic program in professional Social Work education leading to the degree of Master of Social Work.

The curriculum is designed for full time study with entry limited to the fall semester. The course content, including field practice, is organized in a sequence designed to assure integration and progression of content. Part time study, in designated classes, is possible only in the first year program.

Field Instruction is an integral segment of the full time course of study in both years. This practice experience is provided in selected agencies under professionally qualified Field Instructors.

ADMISSION

The admissions requirements of the School are equivalent to and consistent with those of the Graduate College.

Application is made to the Graduate School of Social Service Administration. For information regarding its course of study, admissions procedure and for application forms, write the Office of the Dean.

GRADUATE COLLEGE

WILLIAM J. BURKE, Ph.D., Dean

The development and interpretation of new knowledge and creative work are important functions of the University and matters of specific concern to those involved in the programs available in the Graduate College. For students who have demonstrated a high level of ability and promise at the undergraduate level, graduate work offers an opportunity for further intellectual challenge in advanced and more specialized areas.

GRADUATE DEGREE PROGRAMS OFFERED

Master of Arts
Master of Science
Master of Arts in Education
Master of Business Administration
Master of Fine Arts
Master of Music
Master of Natural Sciences
Master of Public Administration
Master of Science in Engineering
Master of Social Work
Education Specialist
Doctor of Business Administration
Doctor of Education
Doctor of Philosophy

Master of Arts and Master of Science. The master's degree is offered with a major in: Accounting, Anthropology, Art, Biological Sciences, Botany, Chemistry, Economics, Engineering, English, French, Geography, Geology, German, History, Home Economics, Humanities, Mathematics, Music, Philosophy, Physical Education, Physics, Political Science, Psychology, Sociology, Spanish, Speech, and Zoology.

Doctor of Philosophy. The Ph.D. degree is offered in the following fields: Botany, Chemistry, Education, Engineering, English, Mathematics, Physics, Psychology, and Zoology.

ADMISSION TO THE GRADUATE COLLEGE

A student who has earned a bachelor's degree or a graduate degree from an accredited college or university is eligible to apply for admission to the Graduate College of Arizona State University. Application forms may be obtained by writing to the Office of Admissions.

At least two months before the first enrollment, the Office of Admissions should have received the application for admission, two transcripts of all undergraduate and graduate work and other supporting documents. The transcripts are to be sent directly to the Office of Admissions by the registrar of the college or university which the applicant previously attended. For that reason the applicant should write to the registrars concerned and then allow them time to process and mail the transcripts. Students who are also applying for assistantships, fellowships or scholarships should make sure that such applications for admission and other materials reach the Office of Admissions in ample time to meet any established deadline. It is impossible to insure action on any application received after the dates stated. A qualified applicant, whose application has been filed later than the deadline, may be permitted to enroll in graduate classes as an unclassified student. He will maintain such status until all of the required forms and transcripts have been received and a decision regarding his admission to a program has been reached by the college or department concerned and the Graduate College.

All documents received by the University in connection with such applications for admission become the property of Arizona State University. Under no circumstances will they be duplicated, returned to the applicant, or forwarded to any agency or other college or university.

Admission to the Graduate College of Arizona State University will be granted to applicants who show evidence of high promise in pursuing graduate study. In all instances the college or department in which the student wishes to study must indicate its willingness to accept the student. All applications for admission must be approved by the Dean of the Graduate College. The applicant will receive formal notice of admission from the Office of Admissions.

Applicants may be admitted to the Graduate College under three classifications:

Regular Classification. Applicants will be considered for admission with regular classification if they are acceptable to the college or department involved and have an average of "B" (3.0) or better in all work leading to a bachelor's degree. Applicants who do not meet the latter criterion may qualify for admission if they are able to present to the college or department of their choice convincing evidence of their ability to do high-quality graduate work. In this connection, consideration will be given to those students having an overall average of at least 2.5 and a "B" average in the undergraduate major or a "B" average in the last two years of undergraduate work. Applicants are encouraged to submit scores on the aptitude section of the Graduate Record Examination or other predictive examinations. These should be sent directly to the Office of Admissions from the testing service involved.

Provisional Status. A student applying for a degree program may be admitted to graduate study with provisional status if the college or department concerned requires additional evidence that the student is qualified for admission with regular status. No student may maintain provisional status indefinitely. The college or department concerned will normally make a final determination on a student on provisional status by the time he has completed 12 hours of approved graduate study. If an applicant has extensive deficiencies that require an additional year or more to remove, he is advised to register in an undergraduate program.

Unclassified Status. This classification is reserved for any qualified applicant who wishes to engage in graduate study but who is not pursuing a graduate degree program. A person who holds a bachelor's degree from an accredited college or university, whose record indicates that he is qualified to study subjects of his choice, may be admitted as an unclassified student. A student with an unclassified status who later wishes to be considered for regular admission may apply to such a program no more than ten semester hours earned while on unclassified status. Credit for any such work must be approved by the college or department concerned after a review of the proposed program of study.

Foreign Student Admission. Prospective students from foreign countries should contact the Office of Admissions at least a year before they plan to be admitted. They will receive the necessary instructions and application blanks which are to be filled in and returned to this office. The applicant should make sure that other documents are sent at about the same time, especially transcripts from colleges and universities attended, letters of recommendation, certification of proficiency in English, and a statement of financial responsibility. After being admitted, it may be necessary for a student to take a test of his ability to use English. If the test results indicate, the student may be requested to enroll for special training in English. This will limit his program of study until he can use English effectively.

After the application has been processed, a letter stating the decision will be mailed to the student. A prospective student should not make plans to leave his country until he has received notification of admission. Ordinarily such a statement regarding admission is required before the student can be issued a passport or visa.

Transient Graduate Students. A student in good standing at another graduate college who wishes to earn credits for transfer to that institution may register for a specified number of hours of credits either in a summer session or in a regular semester. He will be admitted as a "Transient Graduate Student" and will not need to submit a transcript but must submit a letter from the graduate dean of the other institution stating that the applicant is in good standing and is authorized to register for specified courses.

Graduate Study by Arizona State University Faculty Members. A member of the university faculty holding the rank of assistant professor or higher may not earn a graduate degree from Arizona State University. He may, however, be permitted to pursue graduate work on a non-degree basis or to take courses for transfer to another institution.

Graduate Credit for Seniors. An Arizona State University senior who is within 12 semester hours of graduation and whose undergraduate work qualifies him for graduate study may request permission to register for a sufficient number of additional hours of approved courses for graduate credit to complete his program. All requests must be approved by the college or department concerned and by the Dean of the Graduate College. The necessary Senior Permit forms are available at the Graduate College. This approval must be secured well in advance of registration.

Course Load. The course load is determined by the supervisory committee but is not to exceed 15 semester hours of graduate work.

Scholarship. Excellence in performance is expected of students doing graduate work. A student who is not doing satisfactory work may be withdrawn from the degree program by the Dean of the Graduate College upon the recommendation of the college or department concerned. A grade point average of "B" (3.0) or better for all graduate work is required for graduation with an advanced degree. Grades below "C" cannot be used to meet the requirements for a graduate degree. Grades from transfer credit will not be included in computing the grade point average. Graduate course work other than thesis reported "incomplete" must be completed within one year of the official ending of the course.

Graduate Credit Courses. Courses carrying graduate credit are numbered 400g, 500, 600, and 700. The 400g and 500 level courses are open to graduate students and qualified seniors at Arizona State University. The 300 and 400 level courses may be used for graduate credit if they have the recommendation of the supervisory committee and Dean of the Graduate College. The 600 level courses generally are reserved for the Education

Specialist degree program and other specialized professional programs. The 700 level courses are reserved primarily for special needs of the doctor's degree program.

Graduate Catalog. The Graduate Catalog contains a detailed description of the advanced degree programs offered at Arizona State University. Copies of the Graduate Catalog and application forms may be obtained from the Office of Admissions.

MASTER'S DEGREE

Admission to the Master's Degree Program. Students wishing to enroll in a master's degree program at Arizona State University are admitted according to the procedure described on page 199. Since graduate work presupposes adequate training in a selected field at the undergraduate level, deficiencies will be specified at the time of admission by the college or department involved.

Credit Requirements. A minimum of 30 semester hours of course work approved by the supervisory committee and the Graduate College is required. More than 30 semester hours may be required in certain programs.

Supervisory Committee. Upon admission of the applicant to regular or provisional status, the Dean of the Graduate College upon the recommendation of the college dean or the department chairman appoints a supervisory committee for the student. This committee consisting of a chairman and other members shall work out a program of study with the student, direct his thesis or project and administer his final examination(s).

Residence Requirements. A minimum of 20 semester hours of approved graduate work taken on campus is required.

Language Requirements. Language requirements are determined by the department in which the student is enrolled (see Graduate Catalog).

Thesis Requirements. The requirement of a thesis is determined by the college or department concerned (see Graduate Catalog). The final draft of the thesis must be reviewed by the supervisory committee and the Dean of the Graduate College at least six weeks before commencement.

Candidacy. A student should apply for admission to candidacy as soon as he has successfully completed 12 hours of graduate work with a grade point average of at least 3.0 in an approved graduate program of study, has removed all listed deficiencies, and has passed any required foreign language examination.

Final Examinations. A final examination, written, oral, or both is required. The dates for these examinations are set by the Graduate College once each semester and once each summer session as listed in the Graduate College Calendar. A student is not eligible to apply for any final examination until he has been admitted to candidacy. The final examination in defense of the thesis must be conducted at least three weeks before commencement.

Transfer of Credits. A maximum of six semester hours of graduate credit taken in other institutions may be transferred for credit toward a master's degree, provided the courses are an acceptable part of the program of study planned by the supervisory committee. Such courses must have been taken in an accredited college or university and must be acceptable toward graduate degrees at that institution. Only courses with an "A" or "B" grade may be transferred.

Extension Courses. Up to 10 semester hours of credit toward a master's degree may be earned in extension courses offered by Arizona State University.

Maximum Time Limit. All of the work offered toward a master's degree program must be completed within six consecutive years.

EDUCATION SPECIALIST DEGREE

The Education Specialist degree program is designed to provide opportunity for professional persons in the field of education to develop skills as highly competent practitioners in the various areas of education.

Programs of study for the Education Specialist degree are offered in:

1. Educational Administration and Supervision
2. Curriculum and Instruction
3. Counseling and Student Personnel
4. Elementary Education
5. Higher Education
6. Secondary Education
7. Teaching Specialist
8. Social and Philosophical Foundations of Education
9. Adult Education

Admission to the Education Specialist Degree Program. To be eligible for admission the student must have a bachelor's degree from an accredited institution and have at least one year of successful teaching experience. Normally the student will have a master's degree when he enters. The following items are to be sent to the Office of Admissions:

1. Application for admission in duplicate.
2. Transcripts in duplicate of all undergraduate and graduate work.
3. Letter of intent.
4. Three letters of recommendation.

The necessary application forms may be obtained from the Office of Admissions.

The applicant's acceptability is judged by the graduate committee of the department and recommendation for admission is made to the Dean of the Graduate College. Judgments for admission are based upon:

1. Records of scholastic ability.
2. Satisfactory undergraduate program in education.
3. Interviews administered by the department and/or performance on examinations.
4. An adequate background in the applicant's field of specialization.

Supervisory Committee. The Dean of the Graduate College upon recommendation of the department chairman appoints the supervisory committee. Each area of study included in the degree program will be represented on the committee. The supervisory committee shall approve the program of study, prepare and administer qualifying and comprehensive examinations, approve the applied project, and serve on the final oral examining committee.

Program of Study. Sixty semester hours are required beyond the bachelor's degree. This may include no more than 30 semester hours in a master's degree program. At least 48 hours of course work in the program must be earned in 500 level or above courses, with a minimum of 18 hours of course work in education and 30 hours in the area of specialization. The project may be included in this total.

Credits may be transferred from other recognized institutions. The number of credits accepted on transfer depends upon the objectives approved by the supervisory committee. A minimum of 24 semester hours in the approved program of study shall be taken at Arizona State University following admission to the program.

Residence. Normally the candidate must expect to spend the equivalent of two full academic years in graduate study, which may include one year spent in attaining the master's degree. One academic semester or a ten-week summer session must be spent in full time residence at the University before admission to candidacy for the Education Specialist degree. Additional residence may be required by certain departments in order to meet special needs.

Maximum Time Limit. The Education Specialist degree requirements must be completed within three years after the comprehensive examinations have been passed.

Comprehensive Examinations. When the student has essentially completed the program of study, he will apply to the Graduate College through his supervisory committee for permission to take his oral and written comprehensive examinations. Failure in the comprehensive examinations will be considered final unless the supervisory committee recommends a re-examination. Only one re-examination is permitted. At least three months must elapse before a re-examination may be scheduled.

Admission to Candidacy. A student should apply for admission to candidacy promptly after he has completed 45 hours of course work, passed the written and oral comprehensive examinations, and has had the problem and title of his applied project approved by his supervisory committee.

Applied Project. Upon recommendation of the supervisory committee, a student may enroll for the applied project after completion of 12 hours of approved course work in the degree program.

Final Examination. The final oral examination for the Education Specialist degree program in defense of the applied project report is administered by the supervisory committee. This examination is scheduled through the Graduate College and must be held at least three weeks before graduation.

Graduation. After the final oral examination has been passed and the applied project report filed in the office of the Graduate College, the student is eligible for graduation. He must apply for graduation through the Office of the Registrar.

DOCTOR OF PHILOSOPHY

The Doctor of Philosophy degree is granted upon evidence of high attainment in a special field and demonstration of independent scholarship. Such attainment must be demonstrated by significant research or creative work presented in a dissertation. The degree is never conferred solely on the basis of courses completed or study extending over any prescribed period of time.

Admission to the Ph.D. Degree Program. The general requirements for admission to the Graduate College are given on page 199. Graduate students in regular classification may apply for admission to the Ph.D. program by filing a written application with the Office of Admissions.

Supervisory Committee. Upon recommendation of the department chairman, the Dean of the Graduate College appoints the student's supervisory committee consisting of a chairman and four other members.

Program of Study. The courses may be taken entirely within one department or they may be taken in a combination of departments. Credits from other recognized institutions may be transferred provided the courses meet the objectives of the program as defined by the supervisory committee and are approved by the Graduate Council.

Residence. In general, the candidate should expect to devote the equivalent of at least three academic years (84 semester hours) beyond the bachelor's degree. At least two semesters subsequent to the first year must be spent in continuous full-time residence at Arizona State University and at least 30 hours of approved graduate work must be completed at this institution.

Foreign Language Requirement for the Ph.D Degree. Prior to applying for permission to take the Comprehensive Examinations, the student must have demonstrated that he possesses reading knowledge of two of the following languages: French, German, Russian. Languages other than these must have the approval of the student's supervisory committee and the Graduate Council.

All foreign language examinations are administered by the Department of Foreign Languages on the dates listed in the Graduate Catalog Calendar. Students planning to take the examination must register in person at the office of the Foreign Language Department at least three weeks in advance of the examination.

With the approval of the Graduate Council course work may be substituted for one foreign language in the Ph.D. degree program in Education, Engineering, or Psychology. A student may petition to substitute a program of at least nine semester hours of graduate course work, provided this program has the approval of the supervisory committee and is in excess of and supplementary to the ordinary program of study. Such petitions must be submitted prior to enrollment in the courses proposed for substitution.

The petition must state specific course names and numbers and is to be submitted with the doctoral program of study, which will designate the language to be passed and the language for which course work is to be substituted. These courses shall be in one field, must be external to the major and minor areas of interest and must form a coherent group. There must be evidence the courses will contribute more to the candidate's program than would a second language. Only "A" and "B" grades are acceptable in such course work. If prerequisite courses are necessary, these are to be taken in addition to the nine hours. Courses 590 and 592 will not be accepted.

Comprehensive Examinations. When a student has essentially completed the course work in an approved program of study and has satisfied the foreign language requirements, he should request permission from the Graduate College to take his comprehensive examinations. These written and oral examinations are designed to test the student's mastery of his field of specialization. Failure in the comprehensive examinations will be considered final unless the supervisory committee recommends a re-examination. At least three months must elapse before a re-examination may be scheduled. Only one re-examination is permissible.

Admission to Candidacy. A student should apply promptly for admission to candidacy for the Ph.D. degree after he has passed the comprehensive examinations and has had the problem and title of his dissertation approved by his supervisory committee.

Maximum Time Limit. The candidate must take the final oral examination within five years after passing the comprehensive examinations. Any exception must be approved by the supervisory committee and the Graduate Council and, ordinarily, will involve repetition of the comprehensive examinations.

Research and Dissertation. Each candidate will register for a minimum of 24 semester hours credit for research and dissertation. The final draft of the dissertation must be reviewed by the supervisory committee and the Dean of the Graduate College at least six weeks before graduation.

Final Examination. The final oral examination in defense of the dissertation will be scheduled by the Dean of the Graduate College. This examination may not be scheduled earlier than three weeks after the completed dissertation has been reviewed by the supervisory committee and the Dean of the Graduate College. The examination will be conducted by the supervisory committee and others appointed by the Dean of the Graduate College. All final oral examinations must be conducted at least three weeks before graduation.

Graduation. After the final oral examination has been passed and the dissertation has been accepted and filed in the Graduate College, the student is eligible for graduation. He must apply for graduation through the Office of the Registrar on or before the date listed in the Graduate Catalog Calendar.

DOCTOR OF EDUCATION

The basic purpose of the Doctor of Education Degree Program is to provide opportunity for those interested in the field of education to do advanced scholarly study and research. A dissertation based upon this research is required. The degree is never conferred solely as a result of study extending over any prescribed period of time or the completion of a given number of courses. The program for the Doctor of Education degree requires at least the equivalent of three academic years of full-time study beyond the bachelor's degree or two academic years of full-time study beyond the master's degree The Doctor of Education degree is offered in the following areas:

- Adult Education
- Art Education
- Business Education
- Curriculum and Instruction
- Educational Administration and Supervision
- Elementary Education
- Counseling and Student Personnel
- Health and Physical Education
- Industrial Arts Education
- Mathematics Education
- Music Education
- Physics Education
- Science Education
- Secondary Education
- Social and Philosophical Foundations of Education

Admission to the Doctor of Education Degree Program. A student who seeks admission will normally be expected to have a master's degree. An applicant may be required to take special qualifying examinations prepared and evaluated by the graduate committee of the department to which he applies. The general requirements for admission to the Graduate College are given on page 199.

The acceptability of the applicant is judged by the graduate committee of the department and recommendation for admission is made to the Dean of the Graduate College. Judgments for admission are based upon:

1. Records of scholastic ability.
2. Satisfactory undergraduate program in education.
3. Interviews administered by the department and/or performance on qualifying examinations.
4. An adequate background in his chosen field of specialization.

Supervisory Committee. The Dean of the Graduate College upon recommendation of the department chairman appoints the supervisory committee. Each area of study included in the degree program will be represented on the committee.

Program of Study. The courses in the program of study may be entirely in one department or they may be from several departments. A minimum of 90 semester hours of work taken beyond the bachelor's degree is required. At least 28 semester hours of course work must be taken in Education, exclusive of the dissertation.

Upon approval of the supervisory committee, the student may start research activity in connection with the dissertation after he has completed 15 hours of work in the program beyond the master's level.

Credit may be granted for courses taken at other recognized institutions. The number of credits accepted on transfer depends upon the recommendation of the supervisory committee and approval of the Graduate Council.

Residence. The candidate should expect to spend the equivalent of three full academic years in graduate study, which may include one year spent in attaining the master's degree. The amount of time a student must spend in official residence on the campus depends to some extent on his individual program of studies. However, he must satisfy a minimal residence requirement of 30 semester hours within a period of 18 consecutive months, including a maximum of 10 semester hours for research and dissertation credit. Additional residence may be required by certain departments in order to meet special needs.

Comprehensive Examinations. When the student has essentially completed the program of study and has passed his foreign language examinations, if required, he will apply to the Graduate College through his supervisory committee for permission to take his written and oral comprehensive examinations. These examinations are prepared, administered and evaluated by the supervisory committee. Failure in the comprehensive examinations will be considered final unless the supervisory committee recommends a re-examination. Only one re-examination is permissible. At least three months must elapse before a re-examination may be scheduled.

Admission to Candidacy. The student should apply for admission to candidacy promptly after he has passed the written and oral comprehensive examinations and after the problem and title of his dissertation have been approved by his supervisory committee.

Research and Dissertation. Each candidate will register for a minimum of 24 semester hours credit for research and dissertation. The final draft of the dissertation must be reviewed by the supervisory committee and the Dean of the Graduate College at least six weeks before graduation.

Final Examination. The final oral examination in defense of the dissertation will be scheduled by the Dean of the Graduate College. This examination will be conducted by the supervisory committee and others appointed by the Dean of the Graduate College. The final oral examination must be held at least three weeks before graduation.

Maximum Time Limit. All of the requirements for the Doctor of Education degree must be completed within five years after the first of the comprehensive examinations has been passed.

Graduation. After the final oral examination has been passed and the dissertation has been accepted and filed in the Graduate College, the student is eligible for graduation. He must apply for graduation through the Office of the Registrar.

DOCTOR OF BUSINESS ADMINISTRATION DEGREE

The primary objectives of the Doctor of Business Administration degree are to prepare persons for teaching and research in institutions of higher learning, and to develop proficiency for effective service in a leadership capacity in either private business or government. The degree is granted upon the completion of high academic attainment in graduate study, an original research project presented in a dissertation, and comprehensive oral and written examinations.

The D.B.A. program is designed to provide a broad study of the interrelated areas of business administration and a high degree of professional competence in three fields of specialization. Specific objectives expressed in terms of student achievement include the following:

1. Competence in the basic functional fields of business enterprise.
2. Analytical ability and balanced judgment in the solution of business problems.
3. Understanding of human behavior and the impact of social, political, and economic forces in the decision-making process.
4. Facility in the use of management tools of economic analysis, quantitative techniques, and communication.
5. Strength of character and a personal code of ethics.
6. Capability in the use of effective teaching methods in education for business.
7. Desire to continue the pursuit of knowledge and the achievement of excellence in the art and science of management.

Admission to the D.B.A. Degree Program. A student applies for admission to the D.B.A. program by filing a written application with the Office of Admissions. The application is considered by the Graduate Committee of the College of Business Administration in consultation with the academic department of the applicant's major field and a recommendation is then made to the Dean of the Graduate College. Admission is based upon the applicant's entire record. An admissions test is required. An average grade of "B" (3.00) on the previous degree taken is normally required for admission. The D.B.A. program is open to both men and women.

A student normally completes a master's degree or equivalent before entering the D.B.A. program. In an exceptional case, a candidate with a bachelor's degree may be admitted, in which case he shall complete a graduate program of 24 hours (equivalent to a master's degree exclusive of the thesis) before pursuing the doctoral core and specialized fields.

A student who applies for admission to the program without all of the business core courses required by the American Association of Collegiate Schools of Business for admission to graduate study in business may be admitted provisionally until all business core courses are satisfactorily completed. Currently core courses include basic work in each of the following seven areas: accounting, economics, finance, management, marketing, statistics, and business law.

Supervisory Committee. The Dean of the Graduate College, upon recommendation of the Dean of the College of Business Administration, appoints a Supervisory Committee of five faculty members. The Chairman is selected from the student's field of concentration, two members are selected from the student's two supplementary fields, and two members are selected at large from the faculty of the College of Business Administration. The Supervisory Committee approves the program of study, guides the student through his entire period of study, and serves on his examining committee for the general oral examination and the dissertation.

Program of Study. The program is planned to fit the student's background and objectives. The degree is granted upon evidence of demonstrated competency and scholarly achievement, rather than upon the accumulation of hours in a series of prescribed courses. A minimum of 30 semester hours of credit beyond the master's degree is required of all doctoral students, exclusive of the dissertation and the prerequisite business courses generally required by the American Association of Collegiate Schools of Business for admission to graduate study in business. For most students the program will consist of 36 to 42 semester hours, depending on the student's academic background and the fields selected.

The first phase on the program provides broad exposure to the basic areas of business administration. Courses to be taken in this phase depend on the student's previous education at the undergraduate and master's levels. Decisions regarding the number and selection of these courses are based on the student's record and needs, and are made by the Assistant Dean of the College of Business Administration. Ordinarily, the student is required to complete five of the following seven doctoral core seminars:

AC	691	Seminar (Accounting)
BE	691	Seminar (Business Education)
EC	691	Seminar (Economics)
FI	691	Seminar (Finance)
GB	691	Seminar (Statistical Analysis)
MG	691	Seminar (Management)
MK	691	Seminar (Marketing)

Beyond the core program, the student selects three fields from the following: accounting, business education, economics, finance, statistical analysis, management, and marketing. Ordinarily, a minimum of 21 semester hours of course work is devoted to study in these three fields. The field of concentration is normally that field in which the student plans to complete his research and dissertation. The remaining two areas are designated as supplementary fields. One supplementary field may be outside the College of Business Administration, with the approval of the student's Supervisory

Committee. The student who has an interest in advertising, data processing, insurance, office administration, real estate, or transportation may include courses in these subjects within his selected fields, with the approval of the Supervisory Committee.

To satisfy the doctoral requirements, each student must complete a minimum of six hours of macro-economic analysis and micro-economic analysis and a minimum of six hours in probability and business statistics at the graduate level in courses normally reserved for graduate students.

No foreign language is required for the D.B.A. degree.

The Supervisory Committee assists in the selection of courses in the student's major and minor fields during the first semester in which the student is enrolled. A copy of this program, combined with the requirements listed in the core program, is approved by the Dean of the College of Business Administration and the Dean of the Graduate College, and Graduate Council. Any change in the program must be approved in the same manner as the original program.

Residence. The entire program, including course work and dissertation, normally requires the equivalent of two academic years of work beyond a master's degree. Students must spend at least one academic year of the last two years (summer sessions excluded) in full-time course work in residence. The dissertation may be completed *in absentia* with permission of the student's Supervisory Committee and the Dean of the College of Business Administration.

Comprehensive Examinations. During the final semester of course work, the student must apply to the Graduate College through the Supervisory Committee for permission to take his comprehensive written examinations. Examinations are required in the field of concentration and each supplementary field and are designed to test for thorough knowledge of the fields rather than of specific courses taken. A student may repeat a written examination only one time. He is normally required to complete additional course work and to obtain the approval of his Supervisory Committee before permission for a second examination will be granted.

Upon satisfactory completion of all course work and comprehensive written examinations, the student must complete a general oral examination which covers the entire doctoral program, except the dissertation.

Admission to Candidacy. A student applies for candidacy when he has completed his general oral examination and has submitted a proposed dissertation subject. If a candidate fails to complete his dissertation oral examination within five years after completing his comprehensive examinations, it will be necessary for him to be readmitted to candidacy.

Dissertation. The dissertation requires major research of an original and creative nature. The final draft of the dissertation must be submitted at least six weeks before graduation. General rules of the Graduate College for dissertation procedures, format, and microfilming will be followed. (See Doctor of Philosophy Degree for catalog regulations on this subject.)

Dissertation Oral Examination. The final oral examination in defense of the dissertation will be scheduled by the Dean of the Graduate College. All final oral examinations must be conducted at least three weeks before graduation. The candidate will present and defend his dissertation before the members of his Supervisory Committee and others appointed by the Dean of the Graduate College at a meeting open to all faculty members.

Graduation. After the dissertation is officially accepted and the final oral examination passed, the candidate may apply for graduation through the Graduate College Office prior to the required date listed in the Graduate Bulletin.

General Regulations. In all matters not specified above, the standard procedures established by the Graduate College for the Ph.D. degree will apply.

Palm shadows enliven facade of Life Sciences Building.

SUMMER SESSION

ROY C. RICE, Ph.D., Dean

Terms. The summer session consists of a pre-session, two terms of five weeks each, and a post-session.

Air Cooling. Most of the buildings are cooled by refrigeration systems.

Credit. Students are permitted to earn a maximum of six semester hours of credit each five-week session. Four semester hours is the maximum credit which may be earned in the three-week post session. In three ten-week summer sessions, the residence requirement of the University can be met. By attending summer sessions, students can graduate in three years or less.

Admission to the Summer Session. In general, applicants for admission are expected to present evidence of graduation from an approved four-year high school, or evidence of good standing in an accredited college. Mature students, over 21 years of age, are admitted without the above qualifications, but with the understanding that all admission requirements must be satisfied before they can become candidates for the bachelor's degree.

Graduate Study. The summer session offers an excellent opportunity for those who have already acquired a bachelor's degree to do graduate work for personal edification or to work for advanced degrees.

Fees and expenses. The summer school fee is $12.00 per semester hour. Textbooks and supplies may be purchased at the University Bookstore on the campus. Board and room for the summer are furnished on campus at the prevailing rates.

Bulletin. Requests for the Summer Bulletin or other information should be addressed to the Dean of Summer Session.

EXTENSION DIVISION

ROY C. RICE, Ph.D., Dean

Many people who desire to continue their studies while actively engaged in their business or professional activities find it impossible to attend the regular sessions of the University. In response to this demand, the Extension Division has been established and offers two special types of service: extension courses offered at Residence Centers, and correspondence courses. By these two methods, some regular college courses are made available to these people at a moderate cost.

RESIDENCE CENTER CLASSES

Residence Centers will be organized where there is sufficient demand, when approved instructors are available, and when library or laboratory facilities are adequate to provide university-level instruction. A Residence Center and offering must be approved by the Dean of Extension. Two types of programs are carried on at the Residence Centers: (1) recognized and accepted university credit courses that serve to meet degree requirements at the undergraduate and graduate levels, and (2) informal educational experiences for personal pleasure, general cultural advancement, refresher training courses, and the acquisition of new interests, without reference to university-level standards or credit. Courses taken in Residence Centers are counted as residence credit toward bachelor's degree requirements.

The fee for all extension courses is $12.00 per semester hour, and is payable at the time of registration. For further information concerning Residence Center courses, write the Dean of Extension.

CORRESPONDENCE COURSES

Through the use of the mails, the privileges of the University campus and service of the teaching faculty are extended to the student whose daily occupation prevents enrollment in the regular sessions.

Persons desiring to enroll for correspondence courses will write to the Correspondence Division for an enrollment blank and a copy of the Bulletin which gives a list of the courses offered. When this enrollment blank, properly filled out and accompanied by remittance to cover the fee, is received, the first lesson assignments will be mailed to the student.

The fee for correspondence courses is $10.00 per semester hour of credit carried. Credit earned in correspondence courses may be applied toward the bachelor's degree; however, not more than 30 semester hours of credit in correspondence courses and/or by comprehensive examination will be accepted for credit toward the degree. Correspondence courses are not accepted for credit toward the advanced degrees.

Students who fail a course on campus, or at a residence center, are not permitted to take the same course by correspondence.

No student doing work in residence may register for a course by correspondence without obtaining approval of the Admissions and Standards Committee. All inquiries concerning correspondence courses should be addressed to the Correspondence Division.

DEPARTMENTS AND COURSES OF INSTRUCTION

Descriptions of all courses offered by the University during the regular academic year are found in the section which follows. Courses offered as "summer only" courses are not included in this section. For convenience instructional departments and divisions are arranged in alphabetical order.

CLASSIFICATION OF COURSES

The course numbering system has been designed to facilitate sorting and tabulating by machine methods.

Each College and School has a code number to which departmental offerings and subject fields are related.

A complete list of Code Letters, Subject Fields and Departments or Divisions in which the courses are offered appears in each issue of the class schedule.

The university course numbering system is as follows:

100-299	are freshman and sophomore level courses and are designed primarily for these students. Certain courses are closed to freshmen unless they have had the designated prerequisites. This fact may be obtained from the Catalog or from curriculum adviser prior to registration.
300-499	are junior and senior level courses and are designed primarily for these students and other advanced students. Courses designated by "g" following the number are approved for graduate credit. When approved for inclusion in an individual program of graduate study by a supervisory committee appointed by the Dean of the Graduate College, selected 300-499 courses, in addition to 400g courses, may serve the needs of individual graduate students.
500-799	are the graduate level courses open only to graduate students under the conditions posed by their respective programs of study. However, eligible seniors, with the approval of the Dean of the Graduate College, may enroll in certain courses at the 500 level. Ordinarily, 700 level courses are reserved for doctoral students.

PRO-SEMINAR 498g

Small group study and research for advanced students within their major area. Prerequisite: Major in the department or approval of instructor. Credit, 1-3 hours.

INDEPENDENT STUDY 499

The course numbered 499 has been reserved for Independent Study courses in each of the instructional departments or divisions of the colleges at the undergraduate level. Independent Study courses are honor courses and may be taken only by outstanding senior students who have completed at least one semester in residence. Graduate students may also enroll in Independent Study as part of the program of study approved by their supervisory committee and the Dean of the Graduate College. To be eligible for an Independent Study course a student must have a cumulative scholarship index of 3.00 or better in his major or field of specialization.

An Independent Study course is designed to provide an opportunity for the superior senior student or for the graduate student to do an original study or investigation in his major or field of specialization on an individual basis with a minimum of supervision or direction. An Independent Study course is not to be regarded as a substitute for a catalog course, nor as a means of taking a catalog course on an individual basis. Courses listed in the catalog may not be taken as Independent Study courses.

Application for Independent Study courses must be made well in advance of regular registration period with the student's adviser. The application must be signed by the adviser, and approved by the instructor under whom the student will work, and by the chairman of the department or head of the division in which the course is taken. A course fee may be required. Credit, 1-3 hours.

HONORS COURSES

The courses listed in the schedule as 298, 492, 493, and 497 are reserved for students in the Honors Programs in each of the Colleges. Credit, 3-6 hours.

SPECIAL GRADUATE COURSES

Special graduate courses for research methods (500), reading and conference (590), thesis (593), dissertations, etc., are set forth in announcements of the Graduate College and are also listed in the respective departments. Special Graduate courses for Research Methods (500), Practicum (580), Internship (584), Reading and Conference (590), Thesis (593), Conference and Workshop (594), Research Methods (600), Applied Project (601), Practicum (680), Field Work (683), Internship (684), Reading and Conference (690), Research Methods (700), Practicum (780), Internship (784), Reading and Conference (790), Dissertation (799), are set forth in announcements of the Graduate College and are also listed in the respective departments, where offered.

PREREQUISITES

A student registering for a course must meet the prerequisites listed for it or otherwise satisfy the instructor that he has had the equivalent preparation.

WITHDRAWAL OF COURSES

The University does not offer each year all of the courses listed in the catalog. The Schedule of Classes should be consulted for those courses offered each semester and during the summer terms.

AEROSPACE STUDIES

PROFESSOR **Edwards** (Main 214A); ASSISTANT PROFESSORS **Boyland, Downs, Jensen, McElroy, Prong, Robinson**

AEROSPACE STUDIES

AS 101 *Aerospace Studies.* Defense of the United States. Explores the causes of present world conflicts as they affect the security of the United States. Two lectures, one hour leadership laboratory. Credit, 2.5 hours.

102 *Aerospace Studies.* Corequisite: Concurrent enrollment in academic course as prescribed by the Department of Aerospace Studies and listed in the current Schedule of Classes. One hour leadership laboratory. Credit, 0.5 hours.

201 *Aerospace Studies.* Corequisite: Concurrent enrollment in academic course as prescribed by the Department of Aerospace Studies and listed in the current Schedule of Classes. Prerequisite: AS 101, 102 or equivalent. One hour leadership laboratory. Credit, 0.5 hours.

202 *Aerospace Studies.* World military systems. Prerequisite: AS 101, 102 or equivalent. Two lectures, one hour leadership laboratory. Credit, 2.5 hours.

301, 302 *Professional Officer Education.* Growth and development of United States aerospace power and its application as an instrument of national policy. Prerequisite: AS 201, 202 or equivalent. Three lectures, one hour leadership laboratory. Credit, 3 hours each semester.

401, 402 *Professional Officer Education.* The professional officer, professionalism, leadership, and management. Prerequisites: AS 301, 302. Three lectures, one hour leadership laboratory. Credit, 3 hours each semester.

AGRICULTURE

PROFESSORS **Robinson** (Agric. 232), **Barrett, Judd, V. J. Miller, Moody, E. L. Parker, G. L. Richardson**; ASSOCIATE PROFESSORS **Galloway, L. M. Parker, Taysom**; ASSISTANT PROFESSORS **Rasmussen, Riggins**

AGRICULTURAL ECONOMICS

AE 100 *Agricultural Economics.* Economics as applied to agricultural problems. Credit, 3 hours.

206 *Farm and Ranch Accounts.* Accounting and business principles of farm and ranch management. Two lectures, 3 hours laboratory. Credit, 3 hours.

300 *The Agrarian Heritage.* The evolution of agriculture and the impact of man's quest for food and fiber on civilization, development of nations, world exploration and conquest from antiquity until today. Credit, 3 hours.

306 *Farm Management.* Management principles; economic theory and analysis in agricultural production and marketing. Prerequisite: AE 206. Credit, 3 hours.

308 *Agricultural Finance.* Acquisition of capital, use of credit, legal aspects of finance and management working capital. Credit, 3 hours.

310 *Agricultural Marketing.* Underlying principles, concepts, and factors that control the efficient marketing and merchandising of agricultural products. Credit, 3 hours.

402g *Land Economics and Utilization.* Land evaluation, and appraisal, economic classification, use and development. Prerequisite: Nine hours credit in Agricultural Economics or the equivalent. Credit, 3 hours.

406 *Farm and Ranch Organization.* Influence of physical, cultural, and economic resource environments on farming regions, and individual farm and ranch organization; budgeting techniques; field trips. Prerequisites: AE 306 and AS 252 or AG 234. Three lectures, 3 hours laboratory. Credit, 4 hours.

410 *Farm Labor Management.* General principles and economics of farm labor requirements related to farm management costs and income. Credit, 3 hours.

412g *Agricultural Policy.* Government and public interest in agriculture, agricultural price policies and programs. Prerequisite: Nine hours credit in Agricultural Economics or equivalent. Credit, 3 hours.

414g *Farm Cooperatives.* Organization, operation and management of agricultural cooperatives. Prerequisite: Nine hours credit in Agricultural Economics or equivalent. Credit, 3 hours.

AGRICULTURAL MECHANICS

AM 122 *Agricultural Mechanics.* Mechanical skills important to agriculture. One lecture, 3 hours laboratory. Credit, 2 hours.

126 *Farm Machinery.* Field operation of tillage and cultivating implements, planting, fertilizing, and harvesting machinery. One lecture, 3 hours laboratory. Credit, 2 hours.

227 *Agriculture Mechanics.* Design, construction, and repairing of farm equipment. One lecture, 3 hours laboratory. Credit, 2 hours.

326 *Farm Tractors.* Operation, servicing, and repairing of gasoline and diesel-powered tractors. One lecture, 3 hours laboratory. Credit, 2 hours.

328 *Farm Structures and Equipment.* Functional requirements of farm buildings, building materials, and constructional methods. One lecture, 3 hours laboratory. Credit, 2 hours.

428 *Welding for Shop Teachers.* Welding applicable to the farm shop, safety precautions, identification of metals by spark tests, chemical and microscopic analysis. One lecture, 6 hours laboratory. Credit, 3 hours.

AGRONOMY

AG 130 *Crop Production.* Principles of field crop production. Two lectures, 3 hours laboratory. Credit, 3 hours.

232 *Soils.* Properties of soils and their relation to crop production. Prerequisite: CH 111 or equivalent. Two lectures, 3 hours laboratory. Credit, 3 hours.

236 *Crop Production Practices.* Recommended methods and supervised farm experience in field crop production and harvesting. One lecture, 6 hours laboratory. Credit, 3 hours.

237 *Crop Production Practices.* Continuation of AG 236. Credit, 3 hours.

246 *Conservation of Agricultural Resources.* Developing an understanding of the relationships of agricultural resources. Credit, 3 hours.

330 *Soil Fertility.* Use of fertilizers, crop rotations, and water in the management of soils. Prerequisite: AG 232. Two lectures, 3 hours laboratory. Credit, 3 hours.

332 *Commercial Fertilizers.* Composition, properties, availability and economic use of commercial fertilizers and related materials. Prerequisite: AG 232. Credit, 3 hours.

334 *Irrigation.* Water measurement, conveyance and conservation with emphasis on crop production and soil-plant water relations. Prerequisite: AG 232. Credit, 3 hours.

338 *Range Management.* Improvement and utilization of range land. Prerequisites: AS 150; BO 100. Credit, 3 hours.

340 *Weeds and Weed Control.* Identification of weeds and methods of control. Prerequisite: BO 100. Two lectures, 3 hours laboratory. Credit, 3 hours.

342 *Grain Crops.* Production, harvesting, and utilization of grain crops. Two lectures, 3 hours laboratory. Prerequisite: BO 100. Credit, 3 hours.

344 *Alfalfa and Forage Production.* Production and storage of forage crops, pasture management and the place of forage crops in rotations and soil conservation. Two lectures, 3 hours laboratory. Prerequisite: BO 100. Credit, 3 hours.

345 *Cotton.* Production, harvesting, and utilization of cotton and its byproducts. Prerequisite: BO 100. Two lectures, 3 hours laboratory. Credit, 3 hours.

436 *Soil Conservation.* Soil conservation and its application to farm situations. Prerequisite: AG 232. Credit, 3 hours.

441 *Plant Breeding.* Principles and methods used in improving farm crops. Prerequisites: BO 100; ZO 240. Credit, 3 hours.

447 *Crop Production and Management.* Crop production factors and their application to farm management. Farm plans are prepared for crop production enterprises. Prerequisite: AG 334. Credit, 3 hours.

450g *Soil Chemistry.* Chemical and mineralogical properties of soil colloids; weathering, ion exchange, soil solution reactions, and problems of acid and alkaline soils. Prerequisites: AG 232; CH 225. Three lectures, 3 hours laboratory. Credit, 4 hours.

452g *Soil Physics.* Physical condition of soils; water relationships, aeration, structure, and effects of tillage. Prerequisite: AG 334. Three lectures, 3 hours laboratory. Credit, 4 hours.

495g *Recent Advances in Plant Science.* Current literature and recent developments in plant science. Prerequisite: Twenty hours in plant science or approval of instructor. Two lectures and discussion. Credit, 2 hours.

ANIMAL SCIENCE

AS 150 *Animal Husbandry.* Livestock production, management and judging. Prerequisite to other animal husbandry courses. Two lectures, 3 hours laboratory. Credit, 3 hours.

151 *Breeds of Livestock.* History, development and characteristics of breeds of farm animals. Credit, 2 hours.

252 *Animal Feeding.* Feeds and feeding methods, digestion, and balancing rations. Prerequisites: CH 111 or 113 and AS 150. Credit, 3 hours.

253 *Livestock Production Practices.* Supervised farm experience in animal feeding, breeding, fitting for show, and records. Prerequisite: AS 150. One discussion period, 6 hours laboratory. Credit, 2 hours.

254 *Livestock Production Practices.* Continuation of AS 253. Credit, 2 hours.

260 *Meats.* Processing and preservation of meat, meat products, meat by-products, and factors controlling quality. Two lectures, 3 hours laboratory. Credit, 3 hours.

350 *Livestock Judging.* Breed characteristics and comparative judging. Prerequisites: AS 150, 151. Two lectures, 3 hours laboratory. Credit, 3 hours.

359 *Swine Production.* Production, breeding, feeding, and management of swine. Prerequisites: AS 150, 252. Credit, 2 hours.

360 *Beef Production.* Production, breeding, feeding, and management of beef cattle. Prerequisites: AS 150, 252. Credit, 2 hours.

361 *Sheep Production.* Production, breeding, feeding and management of sheep. Prerequisites: AS 150, 252. Credit, 2 hours.

362 *Horse Production.* Production, feeding, management and selection of horses. Prerequisite: AS 150 or approval of instructor. Credit, 2 hours.

451 *Advanced Livestock Judging.* An advanced course in judging livestock. Prerequisite: AS 350. One lecture, 3 hours laboratory. Credit, 2 hours.

453g *Animal Nutrition.* Use of proteins, carbohydrates, fats, minerals, and vitamins by farm animals. Prerequisites: CH 231 and AS 252 or CH 464. Credit, 3 hours.

456 *Animal Breeding.* Genetics applied to animal breeding. Prerequisites: ZO 100; ZO 240. Credit, 3 hours.

457 *Animal Physiology.* Form and functioning of body systems of farm animals. Prerequisites: CH 113; AS 150 or DS 170 or PS 190; ZO 100. Three lectures, 3 hours laboratory. Credit, 4 hours.

458 *Livestock Diseases and Sanitation.* Sanitation and management in disease control. Prerequisite: AS 457. Credit, 3 hours.

460g *Endocrinology.* The physiology of the glands of internal secretion, including those concerned with reproduction. Prerequisite: AS 457. Credit, 3 hours.

464 *Livestock Production and Management.* Methods of production, livestock enterprises, economics, budgeting, finance, loss prevention, and marketing. Prerequisite: AS 252. Credit, 3 hours.

495g *Recent Advances in Animal Science.* Current developments and literature in animal science and management. Prerequisites: Twenty hours in animal science or equivalent. Two hours lecture and discussion. Credit, 2 hours.

DAIRY SCIENCE

DS 170 *Principles of Dairy Husbandry.* Feeding, management, selection and herd improvement, artificial insemination, diseases, milking, and dairy equipment. Two lectures, 3 hours laboratory. Credit, 3 hours.

271 *Dairy Production Practices.* Supervised farm experience, attainment of proficiency in skills associated with a dairy enterprise. Prerequisite: DS 170. One discussion period, 6 hours laboratory. Credit, 2 hours.

370 *Dairy Cattle Selection and Breeding.* Judging, classification, performance records, pedigrees and genetics applied to dairy cattle breeding. Prerequisite: DS 170. Two lectures, 3 hours laboratory. Credit, 3 hours.

373 *Animal Reproduction and Artificial Breeding.* Structure and function of the genital system in natural and artificial breeding of farm animals. Prerequisite: ZO 110. Two lectures, 3 hours laboratory. Credit, 3 hours.

374 *Milk and Milk Products.* Composition, properties, bacteriology, and nutritional value of dairy products. Prerequisites: CH 231; MI 202. Two lectures, 3 hours laboratory. Credit, 3 hours.

474 *Dairy Production and Management.* An integration of the principles of feeding, breeding, and management in dairy operation. Prerequisites: DS 170; AS 252. Three lectures. Credit, 3 hours.

HORTICULTURE

HO 180 *Principles of Horticulture.* Fundamentals of fruit, vegetable, and flower production, and home landscaping. Two lectures, 3 hours laboratory. Credit, 3 hours.

281 *Plant Propagation.* Principles and skills in propagation of plants, using seeds, cuttings, and grafting. Prerequisites: BO 100; one course in horticulture. Two lectures, 3 hours laboratory. Credit, 3 hours.

282 *Lawns and Greens.* Selection, establishment, and maintenance of turf grasses for lawn, park, and sports areas. One lecture, 3 hours laboratory. Credit, 2 hours.

284 *Ornamental Plants.* Characteristics and growth requirements of annuals, perennials, bulbs, shrubs, and trees used for landscaping. One lecture, 3 hours laboratory. Credit, 2 hours.

289 *Horticultural Production Practices.* Practical experience in horticultural production problems. Prerequisite: HO 180. Six hours laboratory. Credit, 2 hours.

380 *Landscaping.* Beautification of homes and public areas by lawns and ornamental plants. Prerequisite: HO 284. Two lectures, 3 hours laboratory. Credit, 3 hours.

385 *Tree-Fruit Production.* Production of citrus and deciduous tree fruits. Propagation, pruning, fertilizing, irrigating, pest control, and harvesting. Prerequisite BO 100. Two lectures, 3 hours laboratory. Credit, 3 hours.

386 *Small Fruits.* Production of grapes, brambles, and strawberries. Planting, pruning, irrigating, pest control, fertilizing, and harvesting. Prerequisite: HO 385. One lecture, 3 hours laboratory. Credit, 2 hours.

387 *Vegetable Crops.* Production of vegetable crops; variety selection, cultural practices, pest control and harvesting. Two lectures, 3 hours laboratory. Credit, 3 hours.

487g *Crop Physiology.* Physiology of crops as influenced by cultural practices and environmental factors. Prerequisite: BO 410. Credit, 3 hours.

488 *Handling of Fruits and Vegetables.* Methods of harvesting, packaging, and storing fruits and vegetables. Prerequisites: BO 100; HO 180 or 385. Two lectures, 3 hours laboratory. Credit, 3 hours.

POULTRY SCIENCE

PS 190 *Poultry Husbandry.* Poultry management and application to local and regional conditions. Credit, 3 hours.

292 *Poultry Production Practices.* Supervised farm experience in poultry feeding, handling eggs, poultry raising for meat production, sanitation practices, and disease prevention. Prerequisite: PS 190. Six hours laboratory. Credit, 2 hours.

391 *Poultry Production and Management.* Economics of production factors; marketing of poultry products; profit calculations. Prerequisite: PS 190. Three lectures with field trips. Credit, 3 hours.

393 *Poultry Diseases and Sanitation.* Health problems of poultry. Description and classification of poultry diseases, their diagnosis, control and prevention. Prerequisite: PS 190. One lecture, 3 hours laboratory. Credit, 2 hours.

495g *Recent Advances in Poultry Science.* Current literature and recent developments in poultry science and management. Prerequisite: Twenty hours in animal science or equivalent. Two hours lecture and discussion. Credit, 2 hours.

ANTHROPOLOGY

PROFESSORS Ruppe (SS 100E), Jones, Stewart; ASSISTANT PROFESSORS Carmack, Ives, Morris, Sample

DEPARTMENTAL MAJOR REQUIREMENTS—

BACHELOR OF ARTS DEGREE CURRICULUM

ANTHROPOLOGY—consists of 45 semester hours of credit of which 30 must be in anthropology and 15 in related fields to be approved by the adviser in consultation with the student. Courses AN 111, 312, 331, 341, and 411 are required. An additional 15 hours in anthropology will be approved by the adviser in consultation with the student. At least 18 semester hours must be in upper division courses.

DEPARTMENTAL GRADUATE PROGRAM—

The Department of Anthropology offers programs leading to the degree of Master of Arts. Consult the Graduate Catalog for requirements.

ANTHROPOLOGY

AN 111 *Elementary Anthropology.* Primitive society, religion, material culture, the origin and antiquity of man and civilization, modern races, linguistics, and the principles of anthropology. Credit, 3 hours.

221 *Indians of the Southwest.* Culture of living Indian tribes — Navajo, Hopi, Pima, Papago, etc. Social problems of the Southwestern Indians. Credit, 3 hours.

231 *Archaeological Field Methods.* The excavation of archaeological sites and the recording and interpretation of data. Includes field experience in this locality. Two lectures, 3 hours laboratory. Credit, 3 hours.

232 *Anthropological Field Session.* Basic anthropological field techniques; guidance in solving representative problems. Prerequisite: Approval of instructor. Credit, 1-5 hours.

241 *Human Origins.* Man's place in nature, fossil men, historic and recent concepts of human races, influence of culture on human evolution. Credit, 3 hours.

311 *Principles of Social Anthropology.* The variations in man's social institutions, culturally conditioned behavior, and mechanisms of social organization and control throughout the world. Not open to anthropology majors. Credit, 3 hours.

312 *Peoples of the World.* An ethnographic survey of the peoples and cultures of Africa, Eurasia, and Oceania. Prerequisite: AN 111 or approval of instructor. Credit, 3 hours.

314 *Primitive Religion.* The origins, elements, forms, and symbolism of religion; a comparative survey of primitive religious beliefs and ceremonies; the place of religion in the total culture. Prerequisite: AN 111 or approval of instructor. Credit, 3 hours.

322 *Peoples of Africa.* The races and cultures of the peoples of Africa, past and present, with special emphasis on the Negroid peoples. Prerequisite: AN 111 or approval of instructor. Credit, 3 hours.

323 *Peoples of Asia.* The races and cultures of Asia, including the more complex cultures of India, China, Japan, and related areas. Prerequisite: AN 111 or approval of instructor. Credit, 3 hours.

331 *Prehistory.* The development of Old World cultures from the Old Stone Age through the Iron Age. Credit, 3 hours.

335 *Southwestern Archaeology: Hohokam and Mogollon.* The prehistoric cultures of the desert and mountain regions of the Southwest. Southern Palaeo-Indian, Hohokam, and Mogollon sequences are analyzed and compared. Prerequisite: AN 111 or approval of instructor. Credit, 3 hours.

336 *Southwestern Archaeology: Basket Maker and Pueblo.* The prehistoric Basket Maker and Pueblo cultures of the Southwest. Cultural sequences leading to the modern pueblos are analyzed. Prerequisite: AN 111 or approval of instructor. Credit, 3 hours.

341 *Physical Anthropology.* Osteology, fossil men, anthropometry, description and analysis of archaeological and contemporary human populations. Prerequisite: AN 111 or approval of instructor. Credit, 3 hours.

342 *Physical Anthropology.* Gene frequencies, clines, polymorphisms, population dynamics; description and analysis of human populations. Prerequisite: AN 111 or approval of instructor. Credit, 3 hours.

351 *Culture and Personality.* The way a culture determines personalities; accepted and deviant behavior; cultural values; comparisons of widely differing cultures. Prerequisite: AN 111 or approval of instructor. Credit, 3 hours.

364 *Museum Techniques.* Laboratory techniques in restoration of artifacts. Museum display practices to present anthropological material. Prerequisite: AN 111 or approval of instructor. Credit, 3 hours.

365 *Laboratory Methods in Archaeology.* Techniques of artifact analysis. Basic archaeological research techniques, methods of report writing. Prerequisite: AN 111 or approval of instructor. May be repeated for credit. Credit, 3 hours.

375 *Method and Theory of Archaeology.* The development of archaeology and the theoretical basis of the discipline. The rationale and methods of reconstruction of past human behavior from archaeological data. Prerequisite: AN 111 or approval of instructor. Credit, 3 hours.

381 *Anthropological Linguistics.* Rudiments of descriptive linguistics; the relationship of language to other aspects of culture. Prerequisite: AN 111 or approval of instructor. Credit, 3 hours.

411g *Social Anthropology.* Social organization, social institutions, and culture change; acculturation, the community study, selected primitive cultures. Prerequisite: AN 111 or approval of instructor. Credit, 3 hours.

412g *American Minority Peoples.* Problems of racial, national and religious minorities in the United States. Prejudice, acculturation and assimilation. Prerequisite: SO 101 or 301 or AN 111. Credit, 3 hours.

413g *Comparative Social Structures.* The varieties of social structure manifested by the world's societies. Emphasis on the structured interpersonal relationships which develop within the kinship framework. Prerequisite: AN 111. Credit, 3 hours.

421g *The North American Indian.* Archaeology, ethnology, and linguistic relationship of the Indians of North America. Current social and economic problems of the Indians. Prerequisite: AN 111 or approval of instructor. Credit, 3 hours.

422g *Archaeology of North America.* The origin, spread, and development of the prehistoric Indians of North America up to the historic tribes. Does not include the Southwest. Prerequisite: AN 111 or approval of instructor. Credit, 3 hours.

423g *Indians of Middle America.* Indian civilizations of Mexico and Central America. The Aztec, Maya and their predecessors. Tribes and folk cultures of the Indians who inhabit these areas at present. Prerequisite: AN 111 or approval of instructor. Credit, 3 hours.

431g *History and Theory of Anthropology.* The historical development of theories and concepts in anthropology. Evolutionism, diffusionism, and functionalism. Psychological and historic theories in anthropology. Required of all graduate students and seniors majoring in anthropology. Prerequisite: AN 111 or approval of instructor. Credit, 3 hours.

432g *Advanced Anthropological Field Session.* Advanced training in anthropological field techniques, analysis of data, and preparation of field reports. Prerequisite: AN 232 or approval of instructor. Credit, 1-5 hours.

441g *Acculturation and Applied Anthropology.* The dynamic processes of culture contact. The impact of Western civilization upon native societies; anthropological problems in colonial and native administration; applied anthropology in the modern world. Prerequisite: AN 111 or SO 101. Credit, 3 hours.

445g *Contemporary Indian Affairs.* Present problems of American Indians resulting from acculturation, minority status, and legislative action. Immediate problems such as health, education, social welfare, legislation, tribal leadership, and other areas will be dealt with in detail. Prerequisite: Approval of instructor. Credit, 3 hours.

451g *Primatology.* The non-human primates; their structure, taxonomy, dispersion, fossil evidence, and social behavior. Prerequisite: AN 111 or 341 or approval of instructor. Credit, 3 hours.

511 *Taxonomy in Social Anthropology.* The principles of classification used in social anthropology with emphasis on the new concepts of culture type. Prerequisite: Approval of instructor. Credit, 3 hours.

531 *Method and Theory in Anthropology.* The relationship between method and theory. A critical and systematic analysis of scientific procedure in all fields of anthropology with special attention to new developments in relation to the problems they were designed to solve. Prerequisite: Approval of instructor. Credit, 3 hours.

532 *Graduate Field Anthropology.* Independent research on a specific anthropological problem to be selected by the student in consultation with the staff. Prerequisite: AN 432 or equivalent and approval of instructor. Credit, 2-6 hours.

580 *Culture and Behavior.* Analysis of the variables which maintain individual behavior in specific cultural settings. Prerequisites: AN 411; PY 112 or approval of instructor. Credit, 3 hours.

591 *Seminar.* Topics will be selected from the following:
- (a) *Primitive Law and Economics.* Credit, 2-3 hours.
- (b) *Processes of Culture Change.* Credit, 2-3 hours.
- (c) *Synthesis in Archaeology.* Credit, 2-3 hours.
- (d) *Early Man in the New World.* Credit, 2-3 hours.
- (e) *Taxonomy in Archaeology.* Credit, 2-3 hours.
- (f) *Problems in Southwestern Ethnology.* Credit, 2-3 hours.
- (g) *Physical Anthropology.* Credit, 2-3 hours.
- (h) *Museology.* Credit, 2-3 hours.

ARCHITECTURE

PROFESSORS ELMORE (ECA 312), STRAUB, ELLNER, WHIFFEN; ASSOCIATE PROFESSORS SHAIFER, GROOMS, MICHELS, WARD; ASSISTANT PROFESSORS COOK, FLYNN, JAKOB, M. LOWENSTEIN, MCCONNELL, OLIVER, PETERSON, RAPP; INSTRUCTORS BERTELSEN, KUTCH; LECTURERS DOUTHIT, COBLENTZ, DEFIEL, GONZALES, HARVEY, LAW, LENDRUM, QUINN, VANREUSEN, YELLOTT, SOLERI

ARCHITECTURE

AC 100 *Introduction to Architecture.* Development of understanding of our physical environment through a study of the forms, functions and determinants of today's architecture, its continuity with the past, and its relation to the developing present. A brief examination of architecture as a profession is included. Credit, 2 hours.

101 *Fundamentals of Architecture.* Examination of the patterns of individual and group interests and activities which are producing the modern architectural environment. Prerequisite: AC 100. Credit, 2 hours.

121, 122 *Drawing and Design.* Elements of composition and fundamentals of mechanical and freehand drawing with emphasis on architectural design applications. Prerequisite: see Admission page 181. Twelve hours studio. Credit, 4 hours each semester.

223, 224 *Architectural Design.* A sequence of design projects requiring synthesis of all knowledge and understanding attained at second-year level. Prerequisite: AC 122. Sixteen hours studio. Credit, 4 hours each semester.

241, 242 *Delineation.* Techniques for design studies and presentations. Prerequisite: AC 122. One lecture, three hours studio. Credit, 2 hours each semester.

243 *Water Color for Architects.* Painting in transparent water color. Emphasis on techniques, composition and color as they relate to architectural subjects and their environment. One lecture, three hours studio. Prerequisite: AC 122. Credit, 2 hours.

251, 252 *Construction.* The nature of materials and techniques of their use in architectural design and construction. One lecture, three hours lab. Credit, 2 hours each semester.

260 *Fundamentals of Structure.* Empirical derivation of elementary structural principles and exploration of their influence on architectural space-form. Credit, 2 hours.

261 *Mechanics.* Principles of mechanics and selected topics of mathematics as the basis for structural analysis. Prerequisite: MA 241. Credit, 3 hours. (Same as CE 220.)

300 *Domestic Architecture.* History, design, construction, financing, and ownership of houses; legal and ethical functions and responsibilities of parties to the residential construction process. For other than architecture students. Credit, 2 hours.

301 *American Architecture.* Architecture in the United States from early colonial times to the present day, with the social, economic and aesthetic factors that have affected it. Credit, 3 hours.

305 *Arid Region Architecture.* Analysis, in the light of historical precedents and contemporary research, of problems arising out of architecture's participation in a desert ecology. Prerequisite: third year standing. Credit, 3 hours.

311, 312 *Historical Architecture.* Architecture as the realization of changing aesthetic and cultural ideals and the expression of changing forms of society. Credit, 3 hours each semester.

317 *Oriental Architecture.* Development of understanding of cultural and ecological factors in the architectural achievements of the Orient through analyses of buildings expressive of the indigenous traditions of India, Southeast Asia, China and Japan. Credit, 3 hours.

320 *Field Study.* An on-site study of several days' duration of the architecture of an out-of-state locale. Prerequisite: AC 325. Credit, 1 hour.

325, 326 *Architectural Design.* A sequence of design projects requiring synthesis of all knowledge and understanding attained at third-year level. Prerequisite: AC 224. Five afternoons a week. Credit, 5 hours each semester.

331 *Survey of Industrial Design.* History, theory and processes of design and production of objects associated with architecture. Credit, 2 hours.

332 *Planning.* History and principles of planning; contemporary urban problems; urban planning techniques currently in use. Credit, 3 hours.

337, 338 *Landscape Architecture.* Theory and techniques of landscape architecture: space organization, material vocabulary and professional techniques as related to architecture and planning. Credit, 2 hours each semester.

353 *Construction.* The nature of materials and techniques of their use in architectural design and construction. Prerequisite: AC 252. One lecture, three hours lab. Credit, 2 hours.

362 *Mechanics.* Principles of mechanics and selected topics of mathematics as the basis for structural analysis. Prerequisite: AC 261. Credit, 3 hours. (Same as CE 320.)

363 *Structures.* Principles of structural analysis as the basis for structural design. Prerequisite: AC 362. Two lectures, three hours lab. Credit, 3 hours. (Same as CE 321.)

413, 414 *Modern Architecture.* Architecture from the eighteenth century to the present, with emphasis on those developments in design, theory, materials and techniques which have contributed most to the formation of contemporary architecture or are most relevant to the contemporary situation. Prerequisite for architecture students: AC 312. Credit, 3 hours. each semester.

415 *Contemporary Architecture Seminar.* Discussion of, and presentation of reports on, important aspects of contemporary architecture and major topics of contemporary theory and criticism, to further the orientation of the student in the architectural present. Prerequisite: AC 413 and 414. Credit, 2 hours.

427, 428 *Architectural Design.* A sequence of design projects requiring synthesis of all knowledge and understanding attained at fourth-year level. Prerequisite: AC 326. Five afternoons a week. Credit, 5 hours each semester.

429 *Architectural Design.* A sequence of design projects requiring synthesis of all knowledge and understanding attained at fifth-year level. Prerequisite: AC 428. Five afternoons a week. Credit, 5 hours.

433 *Urban Design.* Elements of urban aesthetics; urban redevelopment programs; new communities; economic and social factors affecting urban design. Prerequisite: AC 332. Credit, 2 hours.

435, 436 *Architecture Workshop.* A concentrated study of practical and theoretical aspects of architecture carried on as a full-time summer experience. Prerequisite: Third-year design and faculty approval. Credit, 6 hours each session.

444g *Architectural Craft.* Investigation of the medium of sand casting as a means of design and as a technique of making either models or full-size architectural elements. Co-requisite: AC 325. One lecture, three hours laboratory. Credit, 2 hours.

446 *Elements of Urban Development.* Economic, social, physical and political factors which influence the form of urban developments; contemporary development standards for residential, commercial and industrial uses. Credit, 2 hours.

447 *Problems in Urban Development.* Group projects involving the programming of an urban development on a virgin site. Prerequisites: AC 332, 433, 446. One lecture, three hours laboratory. Credit, 2 hours.

456 *Working Drawings.* Technical and management procedures involved in the development and production of architectural documents with emphasis on working drawings and specifications. Prerequisite: AC 353. One lecture, three hours laboratory. Credit, 2 hours.

457 *Advanced Working Drawings.* Development of facility in the organization and preparation of working drawings and specifications. Prerequisite: AC 456. One lecture, six hours laboratory. Credit, 3 hours.

464 *Structures.* Principles of structural design of components as the basis for structural design of buildings. Prerequisite: AC 363. Three lectures, three hours laboratory. Credit, 4 hours. (Same as CE 322.)

465 *Structural Design.* Application of previous studies in mechanics and structures to the structural design of buildings. Prerequisite: AC 464. Two lectures, three hours laboratory. Credit, 3 hours. (Same as CE 424.)

467 *Experimental Structures.* Consolidation and projection of structural knowledge in advanced empirical investigations. Prerequisite: AC 465. Credit, 3 hours.

471, 472 *Mechanical and Electrical Systems.* Study of technical problems of climate control, acoustics, lighting and other mechanical and electrical systems, and exploration of their influence on architectural space-form. Credit, 3 hours each semester.

481g *Design and Construction Processes.* Functions, problems, and joint operating processes of the architect, structural engineer, mechanical engineer, electrical engineer, contractor and others who are individually and collectively involved in the creation of buildings. For other than architecture students. Prerequisite: senior standing. Credit, 3 hours.

482 *Professional Practice.* Legal, ethical, business and management procedures involved in architectural practice and in the construction industry. Prerequisite: AC 456. Credit, 3 hours.

494 *Thesis Research.* Collection, organization, analysis and presentation of data and development of program for the fifth-year thesis in architectural design. Prerequisite: AC 428 and faculty approval of thesis topic. Credit, 3 hours.

495 *Thesis.* Execution and presentation of a terminal project in architecture of such scope, quality, and completion as to qualify for the professional degree, Bachelor of Architecture. Prerequisite: AC 492. Credit, 10 hours.

CONSTRUCTION

CO 101 *Construction Principles.* Functions, characteristics, and scope of the construction industry. Survey of the theory and practice of contracting and its responsibilities and relationships to the American economy. Credit, 2 hours.

113 *Construction Drawing.* Fundamentals of architectural and engineering drawing applied to construction. Two lectures, 4 hours studio. Credit, 3 hours.

126 *Construction Problem Analysis.* Recognition of problems and orderly procedures for solution. Examination of wide range of construction and scientific problems. Familiarization with slide rule, calculators, electronic computers. Co-requisite: MA 141 or equivalent. Credit, 2 hours.

221 *Static Mechanics.* Study of force systems acting on structural members. Vector algebra for effects of forces in space. Centroids, equilibrium, friction, section properties. Prerequisites: MA 241 or equivalent, CO 126. Credit, 3 hours.

243 *Materials of Construction.* Characteristics of natural and manufactured materials of construction, sources, processing, procurement, and uses in buildings, industrial plants and engineering works. Credit, 2 hours.

244 *Mechanical and Electrical Systems of Buildings.* Theory and function of climate control systems, plumbing, acoustics, lighting, and transportation facilities in buildings. Prerequisites: CO 126, MA 241. Credit, 2 hours.

251 *Construction Equipment.* Characteristics, capabilities, limitations, and methods of use of builders' equipment and heavy construction machinery, fleet operations, maintenance programs. Credit, 2 hours.

323 *Strength of Materials.* Analysis of strength and rigidity of structural members in resisting applied forces. Stress, strain, shear, moment, deflections, continuity. Prerequisite: CO 221. Credit, 3 hours.

324 *Mechanics of Materials.* Continuation of study of strengths of construction materials. Combined stresses, reinforced beams, columns, connections, fatigue, theories of failure, limit analysis. Prerequisite: CO 323. Credit, 3 hours.

331 *Construction Safety.* Accident prevention in construction; safety methods, techniques, practices; protective equipment and devices; identification of hazards; safety planning and organization; worker education; occupational diseases; public laws and codes; accident and insurance procedures. Credit, 2 hours.

352 *Construction Field Design.* Mechanical design principles and theory applied to rigging and temporary erection structures, concrete formwork, and materials handling equipment. Prerequisites: CO 221, CO 251. Credit, 2 hours.

381 *Construction Accounting.* Application of basic accounting principles to construction operations. Theory and mechanics of cost reporting. Equipment economics, fiscal procedures and financial controls. Prerequisite: 3 AC 101. Credit, 3 hours.

383 *General Construction Estimating.* Principles, theories and systems of building estimating. Quantity survey techniques, standard formats, classification of work, organization of detail, unit cost determinations, simulated bids. Prerequisites: AC 101, CO 113, CO 126. Credit, 3 hours.

384 *Heavy Construction Estimating.* Principles, methods, and techniques of estimating construction costs for highways, pipelines, bridges, tunnels, dams and other engineering works. Prerequisites: CE 344, CO 383. Credit, 3 hours.

385 *Mechanical Estimating.* Estimating for plumbing, pipefitting, heating and air conditioning in building construction. Credit, 3 hours.

386 *Electrical Construction Estimating.* Estimating for electrical construction in industrial, commercial and residential buildings. Credit, 3 hours.

387 *Building Construction Estimating.* Estimating essentials for commercial and residential building construction. Not open to Construction majors. Credit, 3 hours.

425 *Applied Structural Design.* Economic use of timber, reinforced concrete, and modern steels in building and engineering structures. Foundations, shoring and bracing, curtain walls, folded plates, thin shells, pre-stressed concrete. Prerequisite: CO 324. Credit, 3 hours.

461g *Construction Methods.* Planning and analysis of work methods, production rates, equipment selection, daily scheduling, balancing, and control of crews, materials, and equipment on building and heavy construction projects. Contractor's plant layouts. Prerequisite: CO 384. Credit, 3 hours.

462 *Planning and Scheduling Techniques.* Principles of linear program-

ming applied to construction. CPM, PERT, MAP, etc. Analysis of unit operations, preparation and modification of schedules, cost control. Credit, 2 hours.

463g *Hydraulic Construction Methods.* Design and construction of contractor's facilities for ground water control and river and harbor operations. Pumping, well pointing, caissons, cofferdams, and soil stabilization. Underwater techniques for pile driving, concreting, and pipelaying. Prerequisite: CE 380 or consent of instructor. Credit, 2 hours.

481g *Industrial Construction Estimating.* Estimating for chemical and industrial plant construction. Analysis and determination of erecting and installation costs for building shells, process equipment, plumbing, pipefitting, millwrighting, and instrumentation. Prerequisites: CO 384 or consent of instructor. Credit, 3 hours.

491g *Construction Project Operations.* Functions and responsibilities of the Construction Project Engineer, layouts, charts, progress reports, quantity keeping, pay estimates, change orders, job planning and control, scheduling, investigations and reports of operations. Co-requisite: C0 461g or consent of instructor. Credit, 3 hours.

496g *Construction Administration.* Legal, ethical, business and management procedures of contracting. Contractor's organization, inter-project coordination of crews, facilities, and machinery. Bonding, financing, fiscal planning, budgets, and controls. Relationships with subcontractors, customers, inspectors, and the public. Specifications, contracts, and contract administration. Prerequisite: CO 491. Credit, 3 hours.

494g *Special Construction Problems.* Guided individual student projects applying academic theory to solution of practical problems in the construction industry. Prerequisite: ES 400. Credit, 1 to 3 hours. May be repeated for a maximum credit of 6 hours.

ART

PROFESSORS WOOD (Arts 328), HARTER, SCHAUMBURG; ASSOCIATE PROFESSORS FINK, FULLINGTON, GOO, JACOBSON, MCFEE (Visiting), TAYLOR; ASSISTANT PROFESSORS BRECKENRIDGE, HALE, SCHRIEBER, SMITH, WAGNER; INSTRUCTORS HAHN, RENNELS, STULER

DEPARTMENTAL MAJOR REQUIREMENTS—

BACHELOR OF ARTS DEGREE CURRICULUM

ART—consists of 45 semester hours of credit, not more than 30 hours in courses offered by the Department, with a concentration in one area of specialization, and at least 15 hours in closely related fields to be approved by the adviser in consultation with the student. Courses AR 111, 114, 123, 141, 142; AH 211, 212, 313 are required. At least 18 semester hours must be in upper division courses.

BACHELOR OF SCIENCE DEGREE CURRICULUM

ART—consists of 50 semester hours of credit, with a concentration in one area of specialization to be approved by the adviser in consultation with the student. Courses AR 111, 114, 123, 141, 142; AH 211, 212, 313 are required. At least 20 semester hours must be in upper division courses.

BACHELOR OF FINE ARTS DEGREE CURRICULUM

ART—consists of 76 semester hours of credit, with a concentration in one area of specialization to be approved by the adviser in consultation with the student. Courses AR 111, 114, 123, 131, 141, 142, 161 or 271, 191; AH 211, 212, 313, 441 are required. At least 30 semester hours must be in upper division courses.

DEPARTMENTAL MAJOR TEACHING FIELD REQUIREMENTS—

BACHELOR OF ARTS IN EDUCATION DEGREE CURRICULUM

ART—consists of 45 semester hours of credit in art and related fields. Courses AR 111, 114, 123, 141, 142; AH 211, 212, 313; AE 301, 480 are required. Additional hours to complete the major will be approved by the adviser in consultation with the student. At least 18 semester hours must be in upper division courses.

DEPARTMENTAL GRADUATE PROGRAMS—

The Department of Art offers programs leading to the degrees of Master of Arts, Master of Fine Arts, and Doctor of Art Education. Consult the Graduate Catalog for requirements.

ART

AR 111 *Drawing and Composition.* Drawing and sketching as applied to the realistic and expressive representation of objects, landscapes, buildings, animals, etc., including a study of perspective. Four hours a week. Credit, 2 hours.

114 *Life Drawing.* Development of skill and expressiveness in drawing the basic form, construction, and action of the human figure from live models. Six hours a week. Credit, 3 hours.

123 *Beginning Painting.* Composition, color and technical mastery of painting media. Prerequisite: AR 111. Six hours a week. Credit, 3 hours.

131 *Sculpture.* Exploration of sculptural form and expression through clay, wood, stone, and welded or cast metals. (Section E)—Experimental. For those students wishing to explore not only wood, stone and metal but also clay and other sculptural media. (Section M)—Metal (direct or cast). (Section W)—Wood and stone. Six hours a week. May be repeated for credit. Credit, 3 hours.

141, 142 *Design.* Explores sources of design inspiration and principles fundamental to all the visual arts. Workshop experimentation in a variety of materials and techniques oriented toward architecture, industrial design, painting, sculpture, crafts and other visual arts. Six hours a week. Credit, 3 hours each semester.

161 *Ceramics.* The nature of clay and glazes, hand-forming methods, throwing on the wheel, decorative processes, glaze application, and firing. Prerequisite for art majors: AR 141. Six hours a week. Credit, 3 hours.

181 *Advertising Design.* (Section A)—Practical problems in six major graphic media used in commercial art. Recommended also for journalism and business administration majors. (Section L)—Lettering. Construction, spacing, and arrangement of Roman and Gothic letters. Analysis of italics, script and miscellaneous letter forms. (Section A) Six hours a week. Credit, 3 hours. (Section L) Four hours a week. Credit, 2 hours.

191 *Photographic Art.* Photography as an art medium. Two lectures, 3 hours laboratory. Credit, 3 hours.

211 *Advanced Drawing.* Emphasis on composition; exploration of drawing media. Prerequisite: AR 111. Four hours a week. Credit, 2 hours.

214 *Life Drawing.* Emphasis on figure composition. Prerequisite: AR 114. Six hours a week. Credit, 3 hours.

222 *Watercolor.* Painting in all water-soluble media. Emphasis on techniques, composition and color. Prerequisite for art majors: AR 111. Six hours a week. Credit, 3 hours.

223 *Advanced Painting.* Advanced problems in oil painting. Prerequisite: AR 123. Six hours a week. Credit, 3 hours.

231 *Advanced Sculpture.* (Section E)—Experimental. Experimentation with various materials with emphasis on design and individual instruction. (Section M)—Metal (direct or cast). (Section W)—Wood and stone. Prerequisite: AR 131. Six hours a week. Credit, 3 hours.

241 *Space Design.* Creative design with emphasis on volume and space relationships. Construction in a variety of materials. Continuing use of hand tools and machine tools. Prerequisite: AR 141. Six hours laboratory. Credit, 3 hours.

261 *Ceramics.* Emphasis on decoration and glazing of wheel-thrown ware. Prerequisite: AR 161. Six hours a week. Credit, 3 hours.

271 *Crafts.* (Section E)—Experimental. Contemporary design employing materials such as metal, wood, textiles, mosaics, copper enameling, glass, fabrics, etc. (Section F)—Fabrics. Includes weaving, stitchery, textile printing and cloth collage. (Section M)—Metal. Covers jewelry and an exploratory approach to the hand working of non-ferrous craft metals and associated materials. Development of a personal approach to jewelry design. (Section W)—Wood. Wood carving, making of bowls, tableware, furniture, carved reliefs, etc. Six hours a week. Credit, 3 hours.

281 *Advanced Advertising Design.* (Section A) — Continuation of Advertising Design. (Section F) — Fashion Illustration. (Section L) — Lettering. (Section A) Six hours a week. Credit, 3 hours. (Section F) Six hours a week. Credit, 3 hours. (Section L) Four hours a week. Credit, 2 hours.

291 *Intermediate Photographic Art.* Development of the disciplines and attitudes of the creative artist-photographer. One lecture, 6 hours laboratory. Credit, 3 hours.

311 *Advanced Drawing.* Prerequisite: AR 211. Four hours a week. Credit, 2 hours .

314 *Advanced Life Drawing.* Emphasis on form and anatomical structure of figure and head. Various mediums and techniques. Prerequisite: AR 214. Six hours a week. Credit, 3 hours.

322 *Advanced Watercolor.* Explorations using a variety of surfaces, a combination of media and materials in a continued search for creative form. Six hours a week. Credit, 3 hours.

323 *Advanced Painting Problems.* Problems for those with a serious interest in easel painting or murals. Prerequisite: AR 223. Six hours laboratory, 1 hour research. Credit, 3 hours.

331, 332 *Advanced Sculpture.* Introduction of sculptural problems related to architecture and man's environment. (Section E)—Experimental. (Section M)—Metal (direct or cast). (Section W)—Wood and stone. Prerequisite: AR 231. Six hours a week. Credit, 3 hours each semester.

344 *Environmental Design.* Initial exploration of the design of interior and exterior structures, model construction; presentation drawings. Prerequisites: AR 111, 142. Six hours a week. Credit, 3 hours.

351 *Printmaking.* (Section E)—Experimental. Printmaking processes using serigraph, lucite, glue, woodcut, lithography, etching, etc. (Section I) —Intaglio, etching, engraving, collograph and other intaglio techniques. (Section L)—Lithography. (Section W)—Woodcut. Prerequisites: AR 111, 114, 141. Six hours a week. May be repeated for credit. Credit, 3 hours.

361, 362 *Advanced Ceramics.* Advanced production methods, glaze formula interpretation, some experimental work in clays and glazes. Emphasis on development of individual style. Prerequisites: AR 141, 261. Six hours a week. Credit, 3 hours each semester.

371 *Advanced Crafts.* (Section E) — Experimental. (Section F) — Fabrics. (Section M)—Metal. (Section W)—Wood. Prerequisite: AR 271. Six hours a week. Credit, 3 hours.

381 *Advanced Advertising Design.* (Section A) — Continuation of Advertising Design. (Section F) — Fashion Illustration. (Section I) — Illustration. Covers both advertising and editorial illustration. Students may specialize in cartooning if qualified. (Section L)—Lettering. (Sections A, F, and I) Six hours a week. Credit, 3 hours. (Section L) Four hours a week. Credit, 2 hours.

391 *Advanced Photography.* The manipulation and interpretation of light in all its studio and darkroom aspects. Prerequisite: AR 191. One lecture, 6 hours laboratory. Credit, 3 hours.

411g *Drawing Techniques of the Old Masters.* Historical techniques of drawing from early Renaissance to the present. The making and use of materials and tools including silver point, listre ink, quill pen, pastels and chiaroscuro drawings, as used by Michelangelo, Rembrandt, Tiepolo and other masters. Prerequisites: AR 114, 211. Four hours a week. Credit, 2 hours.

414g *Advanced Life Drawing.* Anatomical research, one hour additional each week. Group criticism. Prerequisites: AR 114, 314. Six hours laboratory, one hour outside preparation. Credit, 3 hours.

421g *Painting Mediums and Techniques.* Designed to acquaint the student with materials and all varieties of painting. Experimental problems in traditional as well as modern synthetic media. Four hours a week. Credit, 2 hours.

422g *Advanced Watercolor.* Experimentation toward a more personal expression. Six hours a week. Credit, 3 hours.

423g *Advanced Painting.* Problems in picture or mural painting in oil, acrylics, or watercolor. Prerequisites: AR 223, 314. Six hours a week. Credit, 3 hours.

425g *Figure Painting.* Portrait and figure painting from model. Prerequisite: AR 423. Four hours a week. Credit, 2 hours.

431g *Advanced Sculpture.* Introduction to professional practices in sculpture. (Section E)—Experimental. (Section M)—Metal. (Section W)—

Wood and stone. Prerequisite: AR 332. Six hours a week. Credit, 3 hours.

444g *Advanced Environmental Design.* Prerequisite: AR 344. Six hours a week. Credit, 3 hours.

451g *Advanced Printmaking.* Advanced printmaking processes in etching, woodcut, lithograph, and serigraphy. Prerequisite: Approval of instructor. Six hours a week. Credit, 3 hours.

461g *Advanced Ceramics.* Studio problems adapted to meet individual needs. Curriculum problems, procedures, and techniques for teachers. Advanced research for the individual potter. Prerequisite: AR 361 or equivalent. Six hours a week. Credit, 3 hours.

471g *Advanced Crafts.* (Section E)—Experimental. Includes creative work in all craft media. (Section F)—Fabrics. Advanced work in weaving, stitchery, textile painting, and other fabrics media. (Section M) — Advanced jewelry, metalsmithing and enameling. Design and construction of holloware and flatware. Six hours a week. May be repeated for credit. Credit, 3 hours.

481g *Techniques of Advertising Production.* (Section A)—Preparation of finished art and mechanicals for reproduction by offset lithography or letter press printing. Prerequisite: 4-GA 136 recommended. (Section I) —Illustration. Advertising and editorial illustration including cartooning if desired. Preparation of a professional portfolio exhibiting the student's ability in the various areas of illustration. (Section F)—Fashion Illustration. Preparation of professional portfolio. Six hours a week. May be repeated for credit. Credit, 3 hours.

489g *Professional Workshop.* Team-taught seminar. Required of all art majors except those in art education. Analysis of professional problems and practices, and critique of creative work. Integration of all art history and studio courses, both two and three dimensional media. Credit, 3 hours.

491g *Color Photography.* The study and application of color photography and printing processes to photographic art. Prerequisite: AR 391. One lecture, six hours laboratory. Credit, 3 hours.

521 *Studio Problems and Techniques.* Advanced study in the fields of painting, sculpture, design, crafts, graphics and ceramics. Six hours a week. May be repeated for credit. Credit, 3 hours.

580 *Creative Terminal Project.* Must be done in one of the five major areas of concentration in the MFA degree program. Must be approved by the student's committee before undertaken, and before completion, the student must submit a complete report. A public exhibition approved by the committee must precede the final examination. Selected materials from the exhibit may be retained by the University on indefinite loan. Credit, 10 or 15 hours.

ART EDUCATION

AE 301, 302 *Art in the Elementary School.* Emphasis on self-understanding through the use of art, concurrent with the study of the art-work of children of all ages from early childhood to mid-adolescence. One lecture, 4 hours laboratory. Credit, 3 hours each semester.

412g *Art Supervision.* Exploration of theory, materials, organization, methods, and curriculum for the art supervisor or consultant; the art supervisor's responsibility in human relations and communications. Credit, 3 hours.

420g *Crafts for the Elementary School Teacher.* Practical laboratory experiences stressing inexpensive and salvage materials that children can use. Combinations of materials and specific knowledges in mosaic, papier-mache, clay, wood, wire, etc. One lecture, 4 hours laboratory. Credit, 3 hours.

480g *Methods of Teaching Art.* Methods of instruction, theory organization and presentation of appropriate content in art. Required of all art education majors. Prerequisites: AE 301, 2-SE 311 or concurrently. Credit, 3 hours.

511 *History and Theory of the Teaching of Art.* Historical and theoretical analysis of contemporary trends in American art education. Credit, 3 hours.

ART HISTORY

AH 102 *Introduction to Art.* Development of understanding and enjoyment of art and its relationship to everyday life through the study of painting, sculpture, architecture, and design. Credit, 3 hours.

211 *Western Art to the Renaissance.* Pre-historic, Egyptian, Greek, Roman and Medieval European art to the Renaissance. Credit, 3 hours.

212 *Renaissance Art.* Western art from the Renaissance to the Neoclassic. Credit, 3 hours.

313 *Contemporary Art.* Western art from the Neoclassic to the present time. Credit, 3 hours.

315 *History of Fashion.* The evolution of costume from early Egypt to the present including its relationship to the civilization and social customs of the time. Credit, 3 hours.

317 *Baroque Art.* The painting, sculpture, architecture and minor arts from the Early Christian Period up to and including the Gothic period. Credit, 3 hours.

318 *Medieval Art.* The painting, sculpture and architecture primarily of Italy, France, and England during the 17th and 18th centuries. Prerequisites: AH 212 and junior standing. Credit, 3 hours.

321 *American Art.* The cultural unfolding of America as reflected in the significant trends in American painting, sculpture, and architecture. Credit, 3 hours.

413g *Primitive Art.* Relation of early art forms from prehistoric and neolithic to Oceanic, African, and pre-Columbian to contemporary art expression. Credit, 3 hours.

415g *Southwestern Indian Art.* The unique arts and crafts of the Southwestern American Indians from pre-historic times as related to their historical background and social customs. AN 221 or 332 recommended. Credit, 3 hours.

416g *Mexican Art.* The art of Mexico and related Central American cultures from the pre-historic to the contemporary schools. Prerequisites: AH 212, 313 or their equivalents. Credit, 3 hours.

417g, 418g *Oriental Art.* First semester, the art of India and Islam; second semester, the art of China, Korea, Japan. Prerequisite: AH 417 or equivalent. Credit, 3 hours each semester.

419g, 420g *Nineteenth and Twentieth Century Art.* First semester, the art of Europe and America of the 19th century; second semester, the art of the 20th century. Prerequisite: AH 313 or equivalent. Credit, 3 hours each semester.

441g, 442g *Aesthetics.* The mature appreciation and understanding of the arts emphasizing the relationships of art, music, philosophy, and literature. Intended to integrate and give meaning to studio skills for majors in art or music, and to teachers and all who wish to increase understanding of modern arts. Credit, 2 hours each semester.

BOTANY

PROFESSORS Canright (LSC 344), Johnson; ASSOCIATE PROFESSORS Dycus, Leathers, Northey; ASSISTANT PROFESSORS Patten, Pinkava

DEPARTMENTAL MAJOR REQUIREMENTS—

BACHELOR OF SCIENCE DEGREE CURRICULUM

BOTANY—consists of a minimum of 45 semester hours of credit in botany and approved related fields, of which 18 must be in upper division courses. Required courses are BO 100, 310 or 499; ZO 100, 240. The remaining courses are to be selected to insure representation of at least four of the following six areas of biology: molecular and cellular, developmental and structural, regulatory, environmental, genetic, and systematic and evolutionary. With the approval of the adviser, the student should select related courses in chemistry, geology, mathematics, and physics to complete the requirements for a major in botany.

MICROBIOLOGY—consists of 45 semester hours of credit, of which 18 must be in upper division courses. Required courses are MI 201, 202, 410, 420; ZO 100, 240, 455; BO 100, 310, 434; CH 332, 465. In addition to the 45 hours in the major, courses PH 111, 112; MA 117, 118, and one year of an approved foreign language are required.

MEDICAL TECHNOLOGY—consists of 55 hours of approved courses in the pre-internship program selected by the adviser in consultation with the student and one year of internship in an A.S.C.P. approved hospital program.

X-RAY TECHNOLOGY—consists of 55 hours of approved courses in the pre-internship program selected by the adviser in consultation with the student and 18 months internship in an approved hospital program.

BIOLOGY—is offered jointly with the Department of Zoology. The B.S. in biology is a Liberal Arts degree for students desiring a broader education in biology than that provided by more specialized degrees in the two departments. The major consists of a minimum of 45 semester hours of credit, of which 18 must be in upper division courses (approximately nine hours from each department). Courses BO 100; ZO 100, 240; MI 201, 202 are required. An additional 30 hours with no more than 15 from one department will be approved by the adviser in consultation with the student. These courses shall be selected so that at least three of the following six areas are represented: environmental, systematic, regulatory, genetic, molecular, and developmental biology. Supplementary courses required are CH 113, 115, 231 or 331, 332; PH 101 or 111, 112; MA 141; one year of a foreign language.

DEPARTMENTAL MAJOR TEACHING FIELD REQUIREMENTS—BACHELOR OF ARTS IN EDUCATION DEGREE CURRICULUM

BIOLOGICAL SCIENCES—consists of 45 semester hours of credit, of which 18 must be in upper division courses. Required courses are BO 100, 170; MI 201, 202; ZO 100, 240, 311 or BO 310; BI 480. The remaining credits must be distributed equally in botany and zoology and must also include courses in the following three areas: regulatory, developmental, and environmental. One year of general chemistry is required and organic chemistry is strongly recommended.

DEPARTMENTAL GRADUATE PROGRAMS—

The Department of Botany offers programs leading to the degrees of Master of Science and Doctor of Philosophy. Consult the Graduate Catalog for requirements.

BIOLOGY

BI 100 *The Living World.* The major biological principles as illustrated by the areas of behavior, biogeography, ecology, evolution, hygiene, morphology, physiology, reproduction and development, and taxonomy. Does not meet science requirement in pre-professional curriculum. Not open to majors in the Biological Sciences. Three lectures, 2 hours laboratory. Credit, 4 hours.

480g *Methods of Teaching Biology.* Methods of instruction, experimentation, organization, and presentation of appropriate content in biology. Prerequisites: 2-SE 311 or concurrently and 20 hours in the biological sciences. Two lectures, 2 hours laboratory. Credit, 3 hours.

BOTANY

BO 100 *General Botany.* The fundamental principles of biology as illustrated by plants, including a brief survey of the plant kingdom. Three lectures, 3 hours laboratory. Credit, 4 hours.

170 *The Flora of Arizona.* The identification of Arizona plants and methods of collecting, preserving, and mounting. Prerequisites: BO 100 or BI 100. One lecture, 6 hours laboratory or field trip, one weekend trip. Credit, 3 hours.

250 *Plant Anatomy.* The development and mature structure of the principal tissues of vascular plants, and the basic patterns and modifications of leaf, stem, root, and flower. Prerequisite: BO 100. Two lectures, 6 hours laboratory. Credit, 4 hours.

280 *General Plant Pathology.* The principles and agents of disease, including field observations and methods of control. Prerequisite: BO 100. Two lectures, 6 hours laboratory. Credit, 4 hours.

301 *Economic Botany.* Plants used by man throughout the world, with particular emphasis on the origin, history, and distribution of food plants. Prerequisites: BI 100; BO 100. Credit, 3 hours.

310 *Special Techniques in Botany.* Approval of instructor and chairman of the department required. May be repeated once for credit. Credit, 3 hours.

320 *Plant Ecology.* Plant associations in relation to the major environment factors. Prerequisite: BO 170 or approval of instructor. Three lectures, 3 hours laboratory or field trip. One weekend field trip. Credit, 4 hours.

360 *Plant Physiology.* Plant growth, nutrition, food synthesis, respiration, and reproduction. Prerequisite: BO 100. Two lectures, 6 hours laboratory. Credit, 4 hours.

425g *Advanced Plant Ecology.* Plant communities of the world; their structure, developmental processes, history and prognosis. Prerequisite: BO 320. Credit, 3 hours.

434g *General Mycology.* Morphology, taxonomy, and economic aspects of fungi with primary emphasis on the lower fungi, ascomycetes, and medical mycology. Prerequisites: BO 100 and/or MI 201, 202. Two lectures, 6 hours laboratory. Credit, 4 hours.

437g *Cacti and Succulents.* Identification, morphology and physiology of the principal desert plants. Prerequisites: BO 250, 360. One lecture, 3 hours laboratory. Credit, 2 hours.

440g *Morphology of the Non-Vascular Plants.* The morphology, life history, and economic importance of the autotrophic cryptogams (algae and mosses). Prerequisite: BO 100. Three lectures, 3 hours laboratory. Credit, 4 hours.

445g *Morphology of the Vascular Plants.* The comparative structure and evolutionary trends in the Tracheophyta. Prerequisites: BO 100, 250, or approval of instructor. Three lectures, 3 hours laboratory. Credit, 4 hours.

450g *Plant Microtechnique.* Methods of handling plant materials for cytological and anatomical examination. Prerequisite: BO 100. One lecture, 6 hours laboratory. Credit, 3 hours.

452 *Plant Cytology.* The structure of protoplasm and its behavior, especially in relation to its hereditary features. Prerequisite: ZO 240. Two lectures, 6 hours laboratory. Credit, 4 hours.

460g *Growth and Reproduction.* Interaction of environmental, metabolic and hormonal factors in vegetative and reproductive phases of plant behavior. Prerequisite: CH 231. Two lectures, 4 hours laboratory. Credit, 3 hours.

471g *Grasses.* Principles underlying the classification and naming of grasses. Prerequisite: BO 170 or approval of instructor. One lecture, 6 hours laboratory, including one weekend field trip. Credit, 2 hours.

475g *Principles of Taxonomy.* The basic principles of flowering plant taxonomy, including angiosperm phylogeny, the preparation of monographs and similar subjects. Prerequisite: BO 100. Credit, 3 hours.

481g *Methods in Mycology and Plant Pathology.* Methods of collecting, isolating and culturing parasitic and saprophytic fungi, as well as procedures for mounting, preserving and preparing fungi for microscopic study. Directed laboratory and field experiments involving additional techniques employed in research. Prerequisites: BO 434; MI 202. Two lectures, 3 hours laboratory and field work. Credit, 3 hours.

490g *Paleobotany.* Plant life of the past, including types of plant fossils, kinds of fossilization, their geologic history, and past geographic distribution. Methods of preparation of plant fossils for study; identification and interpretation of fossilized plant organs. Prerequisites: BO 100; GL 114, or approval of instructor. Three lectures, 3 hours laboratory or field trip. Credit, 4 hours.

511, 512 *Recent Advances in the Biological Sciences.* A review of basic biology in the light of recent advances. Prerequisite: Approval of instructor. May be repeated for credit. Credit, one hour each semester.

522 *Plant Ecological Methods.* Methods for collecting, compiling, and analyzing data used in the study of plant communities. Prerequisite: BO 320. Two lectures, 3 hours laboratory or field trip. Credit, 3 hours.

530 *Experimental Morphology.* Morphological development as it is influenced by both the physical and chemical environment. Prerequisites: BO 445, 460. Two lectures, 6 hours laboratory. Credit, 4 hours.

560 *Physiology of Fungi.* The principles of fungal growth, nutrition, reproduction and other metabolic activities. The processes significant to industry and medicine will also be considered. Prerequisites: BO 360, 280 or 434; CH 231. Two lectures, 6 hours laboratory. Credit, 4 hours.

564 *Plant Metabolism.* Phenomena common to a wide range of plants: Enzyme systems, energy transformations, responses involving light, plant growth reactions. Prerequisites: CH 231, BO 460. Two lectures, 6 hours laboratory. Credit, 4 hours.

572 *Taxonomy of the Higher Fungi.* Principles of collecting, preserving and identifying ascomycetous and basidiomycetous fungi. Consideration of the economic importance and recognition of the edible and poisonous mushrooms. Prerequisite: BO 434. Two lectures, 6 hours laboratory including field trips. Credit, 4 hours.

575 *Experimental Plant Systematics.* The interpretation of taxa, utilizing cytological, genetic, ecological, morphological, and anatomical techniques and data. Prerequisite: BO 475. Two lectures, 3 hours laboratory. Credit, 3 hours.

591 *Seminar.* Topics will be selected from the following:

- (a) *Palynology.* Credit, 3 hours.
- (b) *Plant Geography.* Credit, 3 hours.
- (c) *Microbiology.* Credit, 3 hours.

MICROBIOLOGY

MI 102 *Elements of Microbiology.* Micro-organisms, including parasitic worms, with an emphasis on species of medical importance. Includes fundamental diagnosis, cultivation and handling of human pathogens. Not open to biology and medical technology majors. Three lectures, 3 hours laboratory. Credit, 4 hours.

103 *Microbiology.* Medical bacteriology and its applications to nursing arts. Two lectures, 3 hours laboratory. Credit, 3 hours.

201 *Microbiology.* Bacteria, molds, and other micro-organisms, and their application in industrial, agricultural, hygienic and domestic problems. Prerequisites: CH 111; BI 100 or equivalent. Credit, 3 hours.

202 *Microbiology Laboratory.* The principles and laboratory techniques used in identifying and handling of micro-organisms. Prerequisite: MI 201 or concurrently. Three hours laboratory. Credit, 1 hour.

218 *History of Medicine.* From Babylonian times through present day medicine. For pre-medical and pre-dental students. Credit, 1 hour.

410g *Advanced Microbiology.* A comparative study of the systematic and pathogenic relationships of micro-organisms with a consideration of the physiological activities of the micro-organisms involved. Prerequisites: MI 202; CH 231 and approval of instructor. Three lectures, 6 hours laboratory. Credit, 5 hours.

420g *Immunology.* Principles of immunity and their application to diagnosis, systematics and allergies. Prerequisites: MI 202; CH 231 or equivalent. Two lectures, 6 hours laboratory. Credit, 4 hours.

520 *Immunochemistry.* The chemistry of antigens and antibodies; the chemical basis of immunity and resistance to disease. Prerequisites: MI 420; CH 464. Two lectures, 6 hours laboratory. Credit, 4 hours.

530 *Epidemiology.* Dissemination, incidence and virulence of the etiological agents of human disease in the community, and factors influencing them; principles basic to control. Prerequisite: Ten hours of microbiology. Credit, 2 hours.

540 *Bacterial Genetics.* The development of molecular transfer concepts of hereditary material in bacteria and their significance to modern genetics and microbiology. Prerequisites: Eight hours of microbiology and ZO 240. Credit, 3 hours.

560 *Bacterial Physiology.* Fermentation, respiration and other metabolic processes of bacteria. Prerequisites: Eight hours of microbiology and CH 465, or equivalent. Two lectures, 3 hours laboratory. Credit, 3 hours.

570 *Systematic Bacteriology.* Classification and identification of bacteria. Prerequisite: Eight hours of microbiology. One lecture, 6 hours laboratory. Credit, 3 hours.

580 *Pathogenic Bacteriology.* The etiology of bacterial disease. The pathology, diagnosis and epidemiology of human pathogenic bacteria. Prerequisites: MI 202; CH 231. Three lectures, 6 hours laboratory. Credit, 5 hours.

585 *Virology.* Principles of diagnosis and pathology of viruses and rickettsiae. Prerequisite: MI 580. Two lectures, 3 hours laboratory. Credit, 3 hours.

See related courses: ZO 240 *Principles of Genetics;* ZO 415 *Biometry;* ZO 426 *Limnology,* ZO 428 *Biogeography;* ZO 441 *Cytogenetics;* ZO 443 *Physiological Genetics;* ZO 445 *Organic Evolution;* ZO 520 *Biology of the Desert.*

BUSINESS ADMINISTRATION

DEPARTMENTAL FIELDS OF SPECIALIZATION—

The departments in the College of Business Administration offer fields of specialization in accounting, advertising, economics, finance, general business administration, insurance, management, marketing, office administration, and real estate.

DEPARTMENTAL GRADUATE PROGRAMS—

The departments of the College of Business Administration offer programs leading to the degrees of Master of Science in the fields of Accounting and Economics, Master of Business Administration and Doctor of Business Administration.

ACCOUNTING

PROFESSORS HUIZINGH (BA 202F), BURTON, CARSON (Visiting); ASSOCIATE PROFESSORS HILL, HUNTINGTON, KRUEGER, SANDERS; ASSISTANT PROFESSORS HUGHES, WILKINSON, WRIGHT; LECTURER PYLE

ACCOUNTING

AC 101 *Elementary Accounting.* Introduction to the theory and practice of accounting applicable to the accounting cycle. Includes journals and ledgers, transactional documents, departmental procedures, and the voucher system. Three lectures, one hour laboratory. Credit, 3 hours.

102 *Elementary Accounting.* A continuation of AC 101. Accounting theory and practice applicable to partnerships, corporations, cash, receivables, inventories, fixed assets, liabilities, and manufacturing accounts. Three lectures, one hour laboratory. Credit, 3 hours.

201 *Intermediate Accounting.* Accounting theory and practice applicable to current assets, fixed assets, liabilities, and sources and applications of funds. Prerequisite: AC 102. Credit, 3 hours.

202 *Intermediate Accounting.* Accounting theory and practice applicable to corporate net worth accounts, investments, reserves, and income. Prerequisite: AC 201. Credit, 3 hours.

301 *Management Uses of Accounting.* Development and analysis of accounting data in making managerial decisions. Designed primarily for nonaccounting majors. Prerequisite: AC 102. Credit, 3 hours.

322 *Mathematics of Finance.* Compound interest and annuities, bond valuation, amortization. Prerequisite: GB 161. Credit, 2 hours.

331 *Cost Accounting.* Accounting procedures applicable to job order and process cost manufacturing operations. Prerequisite: AC 102. Credit, 3 hours.

332 *Accounting for Engineers.* Industrial accounting, includes job, process, standard, and estimated costs. Enrollment restricted to students in the College of Engineering Sciences. Credit, 4 hours.

383 *Advanced Accounting.* Accounting theory applicable to partnerships, branches, installment sales, consignments, receiverships, estates and trusts, and governmental units. Prerequisite: AC 202. Credit, 3 hours.

415g *Financial Statement Analysis.* Analytical methods applied to financial statements for the guidance of management and investors. Prerequisite: AC 102. Credit, 3 hours.

432g *Advanced Cost Accounting.* Extension of cost accounting methods and procedures to standard, estimated, and distribution cost systems. Prerequisite: AC 331. Credit, 3 hours.

447g *Accounting Systems.* Modern system building, with appropriate emphasis on data processing and internal control. Prerequisite: AC 331. Credit, 3 hours.

451 *Federal and State Income Tax.* The concept of taxable income; income tax, estate tax, and gift tax laws and regulations pertaining to individuals, partnerships, corporations, and other taxable entities. Prerequisite: AC 202. Credit, 3 hours.

472g *Consolidations and Mergers.* Theory and practice applicable to the consolidation of parent and subsidiary financial statements and the merging of corporate interests. Prerequisite: AC 383. Credit, 3 hours.

481g *Auditing Theory and Practice.* Auditing standards, procedures, programs, working papers, internal control, and the ethical and legal responsibilities of the Certified Public Accountant. Prerequisite: AC 383. Credit, 3 hours.

500 *Accounting Survey and Analysis.* Basic accounting concepts and procedures. The determination of periodic income. Preparation and interpretation of financial statements. Cost accounting. Open only to students without previous credit in accounting. Credit, 3 hours.

501 *Managerial Accounting.* Use of accounting data in the managerial decision-making process and in the analysis and control of business operations. Prerequisite: AC 500 or equivalent. Credit, 3 hours.

505 *Law in Professional Accounting.* Law applicable to the various forms of business organizations and the transactions conducted by these business entities. Prerequisite: GB 305. Credit, 2 hours.

509 *Governmental and Institutional Accounting.* Accounting methods and procedures applicable to federal, state, and municipal governmental units, and religious, charitable, and nonprofit organizations. Prerequisite: AC 202. Credit, 3 hours.

521 *Tax Problems.* Income, estate, and gift tax problems arising in the planning and review of business and investment transactions. Prerequisite: AC 451. Credit, 2 hours.

522 *Tax Practice Management.* The economics of tax practice management and the methodology of tax research, including a survey of conference and court procedures. Prerequisite: AC 451. Credit, 2 hours.

541 *Budgetary Control.* Installation and administration of a budgetary control system, analysis of results, and the use and interpretation of such results by management. Prerequisite: AC 331. Credit, 2 hours.

542 *Controllership.* Functions of the controller and the organization of his department. Prerequisite: AC 331. Credit, 2 hours.

551 *Advanced Accounting Theory.* Critical analysis of the generally accepted accounting theories and principles. Credit, 2 hours.

552 *Problems in Income Determination.* Analysis of problems in the calculation and disclosure of the periodic income of business enterprises. Credit, 2 hours.

560 *C.P.A. Problems.* Complex accounting problems with emphasis on assets, liabilities, net worth, partnerships, corporations, and sources and application of funds. Credit, 2 hours.

561 *C.P.A. Problems.* Complex accounting problems with emphasis on cost and governmental accounting, consolidations, and other advanced problems. Credit, 2 hours.

562 *C.P.A. Problems.* Complex professional problems related to ethics, auditing standards, procedures, and internal control, financial statement presentation, letters of opinion, and tax practice. Credit, 2 hours.

582 *Auditing Theory and Practice.* Practical application of auditing standards and practices to an audit case with practice in the writing of an audit report. Prerequisite: AC 481. Credit, 3 hours.

ECONOMICS

PROFESSORS Cochran (BA 307F), Farris, Headington; ASSOCIATE PROFESSORS Padalis, Plantz; ASSISTANT PROFESSORS Berney, Daane, Gutowsky, Jackson, Knox, Larson, O'Connor, Winkelman; INSTRUCTOR Wilson

ECONOMICS

EC 102 *Development of the American Economic System.* An analytical treatment of the evolution of the American economy. An introduction to economic institutions in the United States. Credit, 3 hours.

201 *Principles of Economics.* Descriptive analysis of the structure and functioning of the American economy. Emphasizes basic economic institutions and the factors determining income and employment levels. Credit, 3 hours.

202 *Principles of Economics.* Price determination and income distribution in a capitalistic economy. Investigation of current economic issues with particular emphasis on labor-management relations, agriculture, international trade, and government regulation of business. Prerequisite: EC 201. Credit, 3 hours.

301 *Money and Banking.* Functions of money, monetary systems, credit functions, banking practices and policies. Prerequisite: EC 202. Credit, 3 hours.

303 *Economic Analysis and Public Policy.* Application of analytical methods to economic aspects of national and international policy problems. Critical evaluation of conflicting theories and proposals. Prerequisite: EC 202, Credit, 3 hours.

321 *Labor Economics.* Historical and theoretical analysis of labor problems and labor relations. Labor force wage theories and practices. Employment and unemployment. Government regulations. Prerequisite: EC 202. Credit, 3 hours.

331 *Comparative Economic Systems.* Economic theories and practices of capitalism, socialism, communism, and fascism. Prerequisite: EC 202. Credit, 3 hours.

336 *International Economics.* Principles and practices of international finance. Techniques of international payments. Exchange rates and their determination. Economic aspects of major international organizations. Prerequisite: EC 202. Credit, 3 hours.

341 *Public Finance.* Principles and practices of taxation, public expenditures, credit, budgetary policy. Prerequisite: EC 202. Credit, 3 hours.

401g *Intermediate Price Analysis.* Value and distribution theory. Price and output decisions of business firms under conditions of competition, monopolistic competition, oligopoly, and monopoly. Prerequisite: EC 202. Credit, 3 hours.

402g *Economics of Income and Employment.* Analysis of determinants of aggregate level of employment, output and income of an economy. Prerequisite: EC 202. Credit, 3 hours.

408g *Foundations of Econometrics.* Integration of economic analysis, mathematical methods, and quantitative procedures into a comprehensive body of knowledge within contemporary economic theory. Prerequisite: EC 202. Credit, 3 hours.

412g *Business Cycles.* Historical, statistical and analytical study of business cycle theory. Comparison of theories of leading economists. Methods of control of cyclical fluctuations. Prerequisite: GB 221 or concurrent registration. Credit, 3 hours.

441g *History of Economic Thought.* Development of economic doctrines. Theories of mercantilism, physiocracy, classicism, neoclassicism, Marxism, and contemporary economics. Prerequisite: Twelve hours of economics or approval of instructor. Credit, 3 hours.

451g *Economics of Public Utilities.* Economic, legislative, and administrative problems in the regulation of public utility rates and service standards. Study of public utility costs, pricing policies, rates, plant utilization, and competition. Prerequisite: EC 202. Credit, 3 hours.

453g *Government and Business.* Development of public policies toward business. Anti-trust activity. Economic effects of government policies. Prerequisite: EC 202. Credit, 3 hours.

461g *Current Economic Problems.* Discussion of current economic issues. Oral and written reports on assigned topics. Prerequisite: Twelve hours of economics or approval of instructor. Credit, 3 hours.

500 *Business Economics.* Fundamentals of micro- and macro-economic analysis. Price and output determination in various market structures. Functional distribution of income. Theory of income and employment. Open only to students without previous credit in economics. Credit, 3 hours.

501 *Managerial Economics.* An approach to management problems from an economic point of view. Includes the application of economic analysis to decision-making in various areas of business policy development. Credit, 3 hours.

503 *International Economic Theory.* Problems of balance-of-payments, commercial policies of the major nations, international economic organizations in theory and practice. Credit, 3 hours.

504 *Fiscal Policy.* Fiscal theory and its appropriate role in determining the economic policies of government. Credit, 3 hours.

505 *Monetary Policy.* Determinants of the money supply and the level of interest rates. Federal Reserve policy and the effectiveness of central banking policy. Credit, 3 hours.

511 *Macro-economic Analysis.* Analysis of the nation's income, output, employment, and general price level. Examination of current theoretical and empirical research and policy problems. Credit, 3 hours.

512 *Micro-economic Analysis.* The theory of the firm, the industry, and market structure with emphasis on demand, cost, price, and profit within the framework of a modified private enterprise system. Credit, 3 hours.

553 *Industrial Concentration and Public Policy.* Application of market theory to contemporary industrial organization, with special emphasis on oligopoly. Structure, conduct, and performance in industrial markets. Recent developments in antitrust policies. Credit, 3 hours.

GENERAL BUSINESS ADMINISTRATION

PROFESSORS Dauten (209A), Overman, Peters; ASSOCIATE PROFESSORS Baty, Becker, Lowe, Smith, Tsagris; ASSISTANT PROFESSORS Bell, Bohlman, Fischer, Neuheisel, Rottman, Wilt; LECTURERS Cochran, Demson, Emerick, Kennedy

FINANCE

FI 301 *Money and Banking.* Functions of money, monetary systems, credit functions, banking practices and policies. Prerequisite: EC 202. Credit, 3 hours.

305 *Credit Management.* Principles and current practices in the field of commercial credit. Organization of the credit department. Evaluation of the various sources of credit information, analysis of credit risk. Credit, 3 hours.

325 *Business Finance.* The financial structure of various types of business organizations, including sole proprietorships, partnerships, and corporations. Methods of securing and managing funds to meet short- and long-term capital requirements. Prerequisites: AC 102; EC 202. Credit, 3 hours.

403g *Personal Finance.* Financial problems and institutions affecting individuals; borrowing, saving, insurance, investment, financial agencies. Not open to students in the College of Business Administration. Credit, 3 hours.

440 *Security Markets.* Types and functions of markets for debt and equity instruments. Flow of funds through the capital and money markets, both domestic and international. Governmental regulation and control. Prerequisite: FI 325. Credit, 3 hours.

441g *Investments.* Analysis and evaluation of various types of securities. Principles of sound investment policy. Prerequisite: FI 325. Credit, 3 hours.

451g *Bank Organization and Management.* Management of bank funds. Credit policies. Credit analysis. Commerical, agricultural, real estate, consumer, and security loans. Handling of distressed loans. Investment portfolios of banks, bank earnings, expenses and dividend policies. Prerequisite: FI 301. Credit, 3 hours.

461g *Cases in Business Finance.* Case problems in financing of business. Analysis of various types of financing. Prerequisite: FI 325. Credit, 3 hours.

501 *Financial Institutions.* Comprehensive analysis of American financial institutions, both private and governmental; their influence upon the operations of the economy; their relationships to the individual enterprise. Extensive reading and intensive analysis of cases. Credit, 3 hours.

511 *Managerial Finance.* Theory and practice in the financial management of business enterprise. Cash and capital budgeting, operating and dividend policies, problems of valuation and capitalization. Prerequisite: FI 325. Credit, 3 hours.

542 *Security Analysis.* Investigation of the securities of representative corporations in major industries. Analysis of financial statements and of pertinent economic data. Security markets. Investment management. Prerequisite: FI 501. Credit, 3 hours.

GENERAL BUSINESS ADMINISTRATION

GB 101 *Introduction to Business.* The organization, functions, activities, and role of business in the American economic system. Orientation of the student to business terminology, practices, problems, and career opportunities. Not open to students who have received credit in EC 202 and MG 301. Credit, 3 hours.

161 *Mathematics of Business.* Mathematical problems encountered in business, including compound interest and annuities. Prerequisite: 1-MA 116 or equivalent. Credit, 3 hours.

221 *Business Statistics.* Descriptive statistics, averages, dispersion, elementary statistical inference, index numbers, time series, and measurement of relationships as applied to business and economic problems. Prerequisite: GB 161. Three lectures, 2 hours laboratory. Credit, 3 hours.

233 *Business Communication.* The development of psychologically sound business communications in correct and forceful English. All outside assignments must be in typewritten form. Prerequisite: 1-EN 102. Credit, 3 hours.

301 *Mechanized Data Processing.* Solution of business data processing problems by means of keypunch, sorter, accounting machine, and summary punch. Uses and limitations of punched card equipment in business data processing. Credit, 3 hours.

302 *Electronic Data Processing.* Fundamentals of electronic data processing in business information systems. Basic concepts of computers, magnetic tapes, random access files. Programming of problems in FORTRAN or COBOL. Introduction to systems analysis and design, flow charting and feasibility studies. Credit, 3 hours.

305 *Business Law.* Contracts, sales, agency, partnerships, corporations, negotiable instruments, personal property, real property, and federal and state regulation of business. Credit, 3 hours.

306 *Business Law.* A continuation of 305. Prerequisite: GB 305. Credit, 3 hours.

322 *Applied Business Statistics.* Applications of probability to business decisions; business and economic forecasts, quality control, applications of variance, regression, and correlation analysis. Prerequisite: GB 221. Credit, 3 hours.

341 *Transportation.* Analysis of economic principles and legislative practices in the regulation of rates and services of rail, motor, air and pipeline transportation. The theory of rates, discrimination, reasonableness, economic costs, and public policy toward transportation agencies. Prerequisite: EC 202. Credit, 3 hours.

345 *Industrial Traffic Management.* Analysis of the business relationships between shippers and carriers with respect to rates and services in the transportation of goods by rail, highway, water, and air. The role and organization of traffic management as a function in business enterprise. Prerequisite: EC 202. Credit, 3 hours.

371 *Principles of Hotel Administration.* The development and organization of the hospitality industry. A survey and evaluation of hotel and motel services. Responsibilities and procedures of the departments of food, maintenance, engineering, and the front office. Career opportunities in hotel administration. Credit, 2 hours.

402g *Data Processor Programming.* Programming of problems for computers in machine language, flow charting, Symbolic Programming System, and automatic coding systems such as FORTRAN or COBOL. Prerequisite: GB 302. Credit, 3 hours.

407g *Data Processing Systems.* Sources, cost, value of information. Information systems and analysis and design. Feasibility studies. Planning computer applications and controls. Prerequisite: GB 302. Credit, 3 hours.

422g *Advanced Business and Economic Statistics.* Applications of multivariate analysis to business and economic problems. Individual student projects utilizing computer programs. Prerequisite: GB 322. Credit, 3 hours.

431g *Business Report Writing.* The organization and preparation of reports of the types used in business. Techniques of collecting, interpreting, and presenting information useful to management. Prerequisite: GB 233. Credit, 3 hours.

451g *Business Research Methods.* The nature and purposes of research. The problem of acquiring knowledge. Validation and the minimization of error. Definition of meaningful questions. Relevant data. Prerequisite: GB 221. Credit, 3 hours.

460 *Commercial Motor Transportation.* Highway systems of the U.S., motor carrier operations, and the regulation of motor transportation. Costs, rates, services, taxes, weights and sizes, coordination and consolidation. Relationships with competitive modes of transportation. Prerequisite: GB 341. Credit, 3 hours.

461 *Air Transportation.* Economic and business aspects of commercial air transportation. Economics of the airline industry, rate-making, government control and assistance to airline operations. Routes and services, equipment and operations, interrelationships with competing modes of transportation. Prerequisite: GB 341. Credit, 3 hours.

462g *Problems in Transportation and Traffic.* Case problems in transportation operations and traffic management of transportation firms. Selection of equipment, pricing, control, finance, labor relations, organization, and location of transportation operations. Prerequisite: GB 341. Credit, 3 hours.

522 *Managerial Statistics.* The role of sampling and statistical control procedures in administrative decision-making under uncertainty. Applications covered include inventory control, statistical quality control, accounting controls, capacity determination, and industrial experimentation. Prerequisite: GB 221 or approval of instructor. Credit, 3 hours.

523 *Statistical Decision-Making.* Fundamental probability distributions, classical and Bayesian inference, and their applications to business decision-making under risk or uncertainty. Prerequisite: GB 322 or GB 522. Credit, 3 hours.

INSURANCE

IN 251 *Principles of Insurance.* Coverages available, buying methods, procedures in settling claims, insurance companies, and vocational opportunities. Prerequisite: GB 101. Credit, 3 hours.

321 *Life Insurance.* Fundamentals of life insurance including types of contracts, functions of various contracts, company organization, rate making, selection of risks and other home office operations. Governmental

supervision of life insurance companies. Prerequisite: IN 251. Credit, 3 hours.

331 *Property Insurance Principles and Coverages.* Policies and principles of fire and casualty insurance. For students planning to make careers in agency or home office work as well as those needing a fundamental knowledge of insurance for business. Prerequisite: IN 251. Credit, 3 hours.

425g *Current Problems in Insurance.* An analysis of major problems and issues in the insurance industry. Prerequisite: Nine hours of insurance. Credit, 2 hours.

432g *Property Insurance Administration.* Rate making, reserves, financial statements, investments, underwriting, claims, prevention, and surveys. For students planning careers in agency or home office work. Prerequisite: IN 331. Credit, 3 hours.

451g *Social Insurance.* Insurance coverages provided by state and federal governments: social security, unemployment insurance, workmen's compensation, and other social or governmental insurance plans. Prerequisite: IN 321. Credit, 2 hours.

REAL ESTATE

RE 251 *Real Estate Principles.* The regulations, practices, legal aspects, and professional ethics of the real estate business. Prerequisite: EC 202. Credit, 3 hours.

302 *Real Estate Management.* Management of residences, apartments, and commercial properties. Consideration of professional standards, methods of business promotion, leasing, insuring, and maintaining properties as an agent of the owners. Prerequisite: RE 251. Credit, 3 hours.

331 *Real Estate Finance.* Sources and availability of funds. Management, servicing, and repayment of loans. Prerequisite: RE 251. Credit, 3 hours.

401g *Real Estate Appraisal.* The factors affecting the value of real estate. Theory and practice of appraising and preparation of the appraisal report. Techniques in appraisals. Prerequisite: RE 251. Credit, 2 hours.

411g *Real Estate Law.* Legal practices as they apply to the real estate field in general and to the field of titles, mortgages, lending, and trust work in particular. Prerequisite: RE 251. Credit, 3 hours.

441g *Real Estate Land Development.* Neighborhood and city growth. Municipal planning and zoning. Development of subdivisions. Agricultural land utilization. Prerequisite: RE 251. Credit, 3 hours.

461g *Current Real Estate Problems.* Recent developments in the field of real estate, finance, taxation, zoning, planning government regulations, and government assistance programs. Prerequisite: RE 251. Credit, 3 hours.

MANAGEMENT

PROFESSORS DAVIS, FEARON, SCHABACKER; ASSOCIATE PROFESSORS GERSHENFELD, GREENE, KAZMIER, REUTER;
ASSISTANT PROFESSOR WHYBARK

MANAGEMENT

MG 301 *Principles of Management.* The fundamentals of organization and administration. Planning, organizing, directing, coordinating and controlling business activity. Credit, 3 hours.

311 *Personnel Administration.* Personnel selection, placement, training, promotion, wage incentives, absenteeism, and counseling. Prerequisite: MG 301. Credit, 3 hours.

331 *Industrial Management.* The principal functions, departmental activities, and policies of manufacturing firms. Organization for production and analysis of production methods. Prerequisite: MG 301. Credit, 3 hours.

335 *Methods Management.* Role of management in methods improvement. The productivity concept as it relates to business efficiency. Development of employee attitudes supporting productivity. Process charts. Methods improvement in the work environment. Class practice in methods analysis. Prerequisite: MG 331. Credit, 3 hours.

338 *Industrial Safety.* Safety methods in industry. Safety codes compensation, inspection, safety educational program, industrial facilities to care for injured workmen, health hazards and protective measures, safeguards on equipment and buildings to prevent accidents. Prerequisite: MG 301. Credit, 2 hours.

413g *Wage and Salary Management.* Installation and administration of a complete wage and salary program, including objectives, policies, organization, control, job evaluation, wage surveys, and winning acceptance for an integrated program. Prerequisite: MG 311. Credit, 3 hours.

422g *Employee Training and Supervision.* A study of the principles of supervision, the techniques of leadership, adjustment of grievances, policy interpretation, group attitude and morale, training and learning processes, and counseling techniques. Prerequisite: MG 311. Credit, 2 hours.

423g *Industrial Relations and Collective Bargaining.* The processes and procedures of collective bargaining. The scope and negotiation of union contracts. Prerequisite: EC 321. Credit, 3 hours.

432g *Materials Management.* Analysis and managerial integration of the material flow process within an organization, including materials research and standards, purchasing, production and inventory control, warehousing and materials movement. Prerequisite: MG 331. Credit, 3 hours.

433g *Managerial Decision-Making.* Role of probability and desirability in management decision-making. Decision theory and models. The decision process. Communication networks and input-outputs in decision-making. Class performance of business games. Prerequisite: MG 301. Credit, 3 hours.

434g *Management Responsibility in Society.* Developments arising from separation of ownership and management and the growth of professional management. The limits of management authority. Relation of profit and service objectives to a business society. Prerequisite: MG 301. Credit, 3 hours.

451g *Human Relations in Business.* Human aspects of business, as distinguished from economic and technical aspects, and how they influence efficiency, morale, and management practice. Prerequisite: MG 301. Credit, 3 hours.

463g *Business Policies.* Analysis of problems encountered by management in its daily operations. Investigation of sound business principles and practices. Integration of the various functional and other policy areas of the firm. Prerequisites: MG 301; FI 325. Credit, 3 hours.

491g *Operations Research.* A study of the scientific methods which make available to executive departments, a quantitative basis for decisions regarding the operations under their control. Early development, value, mathematical analysis, methods, personnel and organization for effective operations research. Credit, 3 hours.

501 *Managerial Concepts.* Analysis of current administrative philosophy and practices, and their historical foundations. Integration of an organization from the point of view of an administrator. Credit, 3 hours.

503 *Organizational Behavior.* The development of effective work groups in business. Analysis of cases in organizational relationships. Group dynamics, effects of change, and informal organization. Prerequisite: MG 501. Credit, 3 hours.

520 *Problems in Personnel Management.* Selecting, developing, maintaining, and utilizing a competent labor force. Case studies of personnel problems. Preparation of a written personnel program. Prerequisite: MG 501. Credit, 3 hours.

522 *Labor Relations and Public Policy.* The development of state and federal legislation. Analysis of recent decisions of courts and labor boards. The legal rights and duties of employers, unions, and the public. Credit, 2 hours.

581 *Management of Production.* Analysis of the production function from a managerial point of view. Conceptual foundations, analysis of major problems and decision processes. Prerequisite: MG 501. Credit, 3 hours.

MARKETING

PROFESSORS Downing (BA 102B), Harris, Hook, Nielander, Zacher; ASSOCIATE PROFESSOR Schmidt; ASSISTANT PROFESSORS Scannell, White; LECTURER Campbell

ADVERTISING

AD 301 *Advertising Principles.* Advertising as a communications tool in marketing and business management. Consideration of creative methods, survey of media, measurements of effectiveness, and coordination with other aspects of the sales and promotional program. Prerequisite: MK 300 or 1-MC 110. Credit, 3 hours.

311 *Advertising Campaigns I.* Planning and preparation of advertising for the printed media, including newspapers, magazines and direct mail. Development of creative strategy. Practice in layout and copy writing. Prerequisite: AD 301. One hour lecture, two hours laboratory. Credit, 2 hours.

312 *Advertising Campaigns II.* Continuation of AD 311. Advertising production, typography and printing. Development and execution of the complete advertising campaign. Prerequisite: AD 311. One hour lecture, two hours laboratory. Credit, 2 hours.

371 *Radio and Television Advertising.* Use of the broadcast media in the advertising program. Preparation and production of commercial continuity. Audience measurement, station selection, and time-buying. Coordination with other media. Prerequisite: AD 301. Credit, 3 hours.

453g *Advertising Campaign Problems.* Problems in the planning and preparation of advertising for various media. Includes layout, copy, and the complete production process. Prerequisite: AD 311. One hour lecture, two hours laboratory. Credit, 2 hours.

461g *Advertising Management.* Administration of the complete advertising program. Advertising in the marketing mix, budgeting, media strategy, measurement of advertising effectiveness and coordination of advertising with other promotional activities. Use of the advertising agency. Prerequisite: AD 301. Credit, 3 hours.

See related courses: 1-MC 110 *Mass Communications*; 1-MC 401 *Public Relations Techniques.*

MARKETING

MK 300 *Principles of Marketing.* Principles and trends in the distribution of goods and services. Prerequisite: EC 202 or concurrent registration. Credit, 3 hours.

302 *Marketing and the Firm.* Selection and continuing analysis of markets to be served. Customers' wants and buying behavior. Marshalling of the firm's resources into strategic programs of marketing action. Prerequisite: MK 300. Credit, 3 hours.

305 *Analytical Methods in Marketing.* Analysis of marketing problems and the application of quantitative methods to their solution. Prerequisites: MK 300, GB 221. Credit, 3 hours.

310 *Principles of Selling.* Basic principles underlying the sales process and their practical application to sales situations. Economic, sociological, and psychological relationships in the market place, applied to sales of industrial and consumer goods and intangibles. Credit, 3 hours.

321 *Principles of Retailing.* Survey of store operations including buying, pricing, selling, control, and store services; markup and expense relationships; store organization and system. Prerequisites: MK 300; AC 102. Credit, 3 hours.

335 *Foreign Trade.* Principles and practices of international trade. Import-export procedures. Distribution and financing practices in foreign markets. Prerequisite: MK 300. Credit, 3 hours.

355 *Purchasing.* Practices and problems confronting the purchasing agent, including sources of supply, market information, material specification and inspection, control records, inventories, stores, and the purchase budget. Prerequisites: MK 300; MG 301. Credit, 3 hours.

401 *Public Relations in Business.* The role of public relations in business, government, and social institutions, with emphasis on policy formulation. Credit, 3 hours.

411 *Sales Management.* Organization of the sales department; sales planning; selection, training, control, and compensation of the sales force. Prerequisite: MK 300. Credit, 3 hours.

424 *Retail Store Management.* Problems of store management including location, layout, customer services, personnel, and operational factors as they affect successful retailing. Prerequisite: MK 321. Credit, 3 hours.

434 *Industrial Marketing.* An analysis of the marketing structure for industrial products. Product lines, channels of distribution, selling, pricing, warehousing, and wholesaling problems. Prerequisite: MK 300. Credit, 3 hours.

460 *Marketing Policies.* Decision-making by the marketing executive. Integration of all elements of the marketing program. Prerequisite: MK 302. Credit, 3 hours.

483g *Marketing Research.* Collection and interpretation of marketing data and its application to decision-making in market selection, product development and promotional efforts. Prerequisites: MK 300 and GB 221. Credit, 3 hours.

501 *Marketing Management.* Analysis of marketing problems from the management point of view. Credit, 3 hours.

502 *Public Relations Policies.* Case analysis of problems encountered in maintenance of favorable relationships between business organizations and the public. Development of sound public relations policies. Prerequisite: MK 401. Credit, 3 hours.

522 *Sales Analysis and Control.* An analytical approach to marketing problems, particularly in the interpretation of findings from sales analysis. Credit, 3 hours.

563 *Market Planning and Programming.* The solution of marketing management problems through case analysis. Credit, 3 hours.

OFFICE ADMINISTRATION AND BUSINESS EDUCATION

PROFESSORS Tate (BA 304B), Green (Visiting); ASSOCIATE PROFESSORS Dawkins, Gryder, Jacks, McCready; ASSISTANT PROFESSORS Huston, Rowe, Wilson; INSTRUCTOR Kirkpatrick; LECTURER Driska

DEPARTMENTAL MAJOR TEACHING FIELD REQUIREMENTS—
BACHELOR OF ARTS IN EDUCATION DEGREE CURRICULUM

BUSINESS—consists of 45 semester hours of credit including the Business Administration Core Curriculum; OA 143, 201, 312, 344; BE 480.

DISTRIBUTIVE EDUCATION—consists of 45 semester hours of credit including the Business Administration Core Curriculum; MK 321; OA 143, 201; BE 301, 490.

BUSINESS EDUCATION

BE 301 *Vocational Education in American Schools.* The basic principles and philosophies of vocational education. Relationship of vocational education to general education. History and legislation. Credit, 3 hours.

480g *Methods of Teaching Business Subjects.* Methods of instruction, organization, and presentation of appropriate content in typewriting, shorthand, bookkeeping, business machines, and basic business courses. Prerequisite: 2-SE 311 or concurrent registration. Credit, 3 hours.

490g *Methods of Teaching Cooperative Education.* To provide preparation for teachers of the work-study program for business occupations. Methods and procedures in developing and co-ordinating a work-study program in the secondary schools and the preparation of materials for instruction. Registration subject to approval of instructor. Credit, 3 hours.

491g *Organization and Management of Adult Programs.* Planning the promotion, supervision and administration of adult educational programs. Community survey techniques to determine needs for training. Personnel and instructional materials for conducting adult classes. Credit, 3 hours.

501 *Foundations of Business Education.* The history, philosophy, princi-

ples and objectives of business education. Problems of curriculum and curriculum evaluation. Contribution of business education to general education. Registration subject to approval of instructor. Credit, 3 hours.

502 *Administration and Supervision of Business Education.* Departmental and classroom problems related to curriculums, equipment, guidance, in-service training, and personnel. The regulation of vocational business education programs by state and federal agencies. Credit, 3 hours.

503 *Tests and Measurements in Business Education.* Constructing, administering, and evaluating tests in secretarial and general business subjects. Diagnostic testing for remedial teaching in these subjects. Credit, 3 hours.

504 *Guidance for Business and Distributive Education.* Occupational surveys and job analysis to determine community opportunities and requirements for employment. Placement, follow up, and counseling for problems encountered by student workers. Legislation affecting business occupations. Credit, 3 hours.

511 *Improving Instruction in Secretarial Subjects.* Modern methodology in teaching typewriting, shorthand, and office practice courses. The psychology of skill building and techniques of office production. Credit, 3 hours.

513 *Improving Instruction in Bookkeeping and General Business Subjects.* Evaluation of methodology and materials used in teaching bookkeeping, general business, and related subjects. The place of basic business education in general education. Credit, 3 hours.

591 *Seminar.* Credit, 2 or 3 hours. Topics to be selected from such instructional areas as:
(a) Office Practice and Machines.
(b) Current Literature.
(c) Data Processing for Teachers.

594 *Study Conference or Workshop.* Conducted by outstanding leaders. Individual conferences, reports, group work, and work on individual problems. Credit, 1 to 6 hours.

OFFICE ADMINISTRATION

OA 101 *Basic Typewriting.* Mastery of the keyboard. Development of speed and accuracy. Tabulation, centering, and business letters. One lecture, 2 hours laboratory. Credit, 2 hours.

113 *Shorthand.* The basic principles of reading and writing shorthand. Dictation of practiced material. Two lectures, 2 hours laboratory. Credit, 3 hours.

143 *Business Machines.* Instruction and practice in addition, subtraction, multiplication, and division on full-key, ten-key, and rotary calculators. One lecture, 2 hours laboratory. Credit, 2 hours.

201 *Advanced Typewriting.* Building skill in typing office problem materials to meet business production standards. Use of electric machines. Prerequisite: OA 101. Two lectures, 2 hours laboratory. Credit, 3 hours.

214 *Shorthand.* Building dictation speed with unpracticed material, and a review of shorthand principles. Prerequisite: OA 113. Two lectures, 2 hours laboratory. Credit, 3 hours.

232 *Records Systems and Filing.* Administration of records systems; analysis and application of various filing systems in the business office. One lecture, 2 hours laboratory. Credit, 2 hours.

312 *Transcription.* Increased speed in sustained dictation and the transcription of mailable business correspondence. Prerequisite: OA 214. Three lectures, 2 hours laboratory. Credit, 4 hours.

331 *Secretarial Procedures.* Instruction and practice in performing various office duties, including methods of handling mail, arranging itineraries, procuring office supplies, using the telephone, and improving human relations. Prerequisite: OA 312. Two lectures, 2 hours laboratory. Credit, 3 hours.

344 *Office Appliances.* Theory and practice in the selection and operation of dictating and transcribing machines, duplicating machines, copying machines, and proportional spacing typewriters. Prerequisite: OA 201. One lecture, 2 hours laboratory. Credit, 2 hours.

351 *Principles of Office Management.* Relationship of the office function to the business enterprise including office location and layout, selection of office equipment and supplies, principles of office organization, supervision of office personnel, employee training programs, office services, and control of office output. Credit, 3 hours.

501 *Office Systems and Procedures.* Methods of establishing, analyzing, standardizing, and controlling administrative systems and procedures including: work simplification, forms analysis, work-flow charting, layout and space analysis, office manuals. Prerequisite: OA 351. Credit, 3 hours.

CHEMISTRY

PROFESSORS Eyring (PS-D102D), Bateman, D. Brown, Burgoyne, Burke, Fuchs, Liu, Pettit, Sanderson, Wiik (Visiting); ASSOCIATE PROFESSORS Aronson, Munk, Thomson, Whitehurst, Yuen, Zaslow; ASSISTANT PROFESSORS Bieber, T. Brown Buseck, Caspar, Guillory, Moore, O'Keeffe, Tackett

DEPARTMENTAL MAJOR REQUIREMENTS—

BACHELOR OF ARTS DEGREE CURRICULUM

CHEMISTRY—consists of 45 semester hours of credit, of which 30 must be in chemistry and 15 in closely related fields. Courses CH 113, 115, 225 or 327, 331, 332, 335, 336, 341, 443, and 451 are required. In addition, PH 111, 112 and MA 117, 118 must be completed. The remaining courses to complete the major will be determined by the adviser in consultation with the student. At least 18 semester hours must be in upper division courses.

BACHELOR OF SCIENCE DEGREE CURRICULUM

CHEMISTRY—consists of 45 semester hours of credit in chemistry. Courses CH 113, 115, 327, 331, 332, 335, 338, 421, 441, 442, 444, and 451 are required. In addition, PH 111, 112; MA 120, 121, and 212; and one year of French, German, or Russian must be completed. The remaining chemistry courses to complete the major will be determined by the adviser in consultation with the student. At least 18 semester hours must be in upper division courses.

American Chemical Society Certification. A student who satisfactorily completes the Bachelor of Science degree program will be certified by the Department of Chemistry to the American Chemical Society as having met the specific requirements for undergraduate professional training in chemistry.

DEPARTMENTAL MAJOR TEACHING FIELD REQUIREMENTS— BACHELOR OF ARTS IN EDUCATION DEGREE CURRICULUM

CHEMISTRY—consists of 45 semester hours of credit in chemistry and related fields. Courses CH 113, 115, 225, 331, 332, 335, 336 (or 231), 341, 443, (or 441, 442, 444), 451, 480 (or PL 480); PH 111, 112; and MA 117, 118 are required. The remaining courses to complete the major will be determined by the adviser in consultation with the student.

DEPARTMENTAL GRADUATE PROGRAMS—

The Department of Chemistry offers programs leading to the degrees of Master of Science and Doctor of Philosophy. Consult the Graduate Catalog for requirements.

CHEMISTRY

CH 101, 102 *Introduction to Chemistry.* Introduction to inorganic, organic and biochemistry. May not be used as a prerequisite for more advanced courses in chemistry. Three lectures, 1 quiz, 2 hours laboratory. Credit, 4 hours each semester.

111* *College Chemistry.* Fundamental principles of chemistry. Prerequisite: Concurrent registration in MA 116. Three lectures, 2 quizzes, 3 hours laboratory. Credit, 5 hours.

113* *General Chemistry.* Fundamental principles of chemistry. Prerequisite: MA 116 or high school mathematics equivalent. Three lectures, 1 quiz, 2 hours laboratory. Credit, 4 hours.

114* *General Chemistry.* Chemistry of metals, nonmetals, and carbon. Prerequisite: CH 111 or 113. Three lectures, 1 quiz, 2 hours laboratory. Credit, 4 hours.

115* *General Chemistry with Qualitative Analysis.* Chemistry of metals and nonmetals, and qualitative inorganic analysis. Prerequisite: CH 111 or 113. Three lectures, 2 quizzes, 4 hours laboratory. Credit, 5 hours.

121 *Qualitative Analysis.* Qualitative separation and identification of common cations and anions. Prerequisite: CH 114. Two quizzes, 4 hours laboratory. Credit, 2 hours.

225* *Quantitative Analysis.* Principles and methods of volumetric and gravimetric analysis. Prerequisite: CH 114 or 115. Primarily for students in agriculture, pre-medicine, pre-dentistry, medical technology. Two lectures, 1 quiz, 6 hours laboratory. Credit, 4 hours.

231* *Elementary Organic Chemistry.* The compounds of carbon, including representative groups of aliphatic and aromatic series. For students of home economics, agriculture and biology. Prerequisite: CH 111 or 113. Three lectures, 1 quiz, 2 hours laboratory. Credit, 4 hours.

300 *Glass Blowing.* Laboratory techniques in glass blowing. Prerequisite: Approval of instructor. Four hours laboratory. Credit, 1 hour.

327* *Quantitative Analysis.* Principles and methods of volumetric and gravimetric analysis. Prerequisite: CH 114 or 115. Required of B.S. chemistry majors. Two lectures, 1 quiz, 9 hours laboratory. Credit, 5 hours.

331*, 332 *General Organic Chemistry.* Chemistry of organic compounds. Prerequisite: CH 114 or 115. Credit, 3 hours each semester.

335, 336* *General Organic Chemistry Laboratory.* Organic chemical experiments in separation techniques, synthesis, analysis and identification, and relative reactivity. Corequisites: CH 331 for CH 335, CH 332 for CH 336. Four hours laboratory. Credit, 1 hour each semester.

338* *Organic Chemistry Laboratory.* Organic chemical experiments in identification, synthesis and rates of reaction. Required of B.S. chemistry majors. Prerequisite: CH 335. Corequisite: CH 332. Eight hours laboratory. Credit, 2 hours.

341* *Elementary Physical Chemistry.* Properties of solids, liquids, gases, solutions, equilibrium, colloidal state. For premedical, biology, agriculture, etc. students. Prerequisites: CH 225 and 231 or 331. Credit 3 hours.

421g *Instrumental Analysis.* Theory and applications of instrumental methods to chemical analysis. Electrical and optical techniques. Prerequisite: CH 442 or concurrently. Three lectures, 3 hours laboratory. Credit, 4 hours.

423g *Analytical Chemistry.* Theoretical principles of analytical chemistry. Prerequisite: CH 442 or concurrently. Credit, 3 hours.

431g *Qualitative Organic Analysis.* Systematic identification of organic compounds. Prerequisites: CH 225 or 327 and 336 or 338 or approval of instructor. One lecture, 6 hours laboratory. Credit, 3 hours.

435g *Organic Laboratory Methods.* Methods of organic synthesis. Emphasis on general types of organic reactions and laboratory techniques employed in preparation, isolation and purification of complex organic products. Prerequisite: CH 431 or approval of instructor. One lecture, 1 conference, 5 hours laboratory. Credit, 3 hours.

441g*, 442g *General Physical Chemistry.* Gases, liquids, solids, solutions, equilibrium, phase rule, electrochemistry, thermodynamics, atomic structure, radioactivity, and colloids. Prerequisites: PH 112 or 4-ES 231; MA 212. Credit, 3 hours each semester.

443g* *Physical Chemistry Laboratory.* Physical chemical experiments. Prerequisite: CH 341 or 441 or concurrently. Three hours laboratory. Credit, 1 hour.

444g* *General Physical Chemistry Laboratory.* Physical chemical experiments. Required of B.S. chemistry majors. Prerequisite: CH 441. One conference, 5 hours laboratory. Credit, 2 hours.

446g* *Radioisotope Techniques.* Radioactivity and detection of nuclear radiations. Quantitative measurements, tracer techniques and study of methods used in agriculture, medicine, industrial radiochemistry and related fields. Especially adapted to meet the needs of persons majoring in fields other than chemistry. Prerequisite: CH 225. Two lectures, 3 hours laboratory. Credit, 3 hours.

447g* *Radiochemistry.* Radioactivity, natural and artificial radioisotopes, nuclear reactions, isolation of isotopes, nuclear energetics, measurement of radioactivity, tracer techniques and other applications. Prerequisite: CH 441 or concurrently. Credit, 2 hours.

448g* *Radiochemistry Laboratory.* Radiation measurements, tracer methods, quantitative identification of isotopes, and other procedures applicable to chemical, physical, engineering and biological problems. Prerequisite: CH 447 or concurrently. One conference, 4 hours laboratory. Credit, 2 hours.

451g *Inorganic Chemistry.* Atomic structure, periodic relationships, chemical bonding, nomenclature, aqueous and non-aqueous chemistry. Prerequisite: CH 225 or 327. Credit, 3 hours.

452g *Inorganic Chemistry Laboratory.* Preparation and purification of typical inorganic substances with emphasis on methods and techniques. Prerequisite: Approval of instructor. One lecture, 3 hours laboratory. Credit, 2 hours.

461g*, 462g *General Biochemistry.* Fundamental chemistry and metabolism of major biological materials and their role in the biochemical processes of living organisms. Prerequisite: CH 332. Credit, 3 hours each semester.

464g* *Elementary Biochemistry.* Chemistry of animal and plant life including biological compounds, tissues, foods and digestion, enzymes, etc. Prerequisite: CH 231 or 332. Credit, 3 hours.

465g* *Biochemistry Laboratory.* Qualitative and quantitative chemistry of carbohydrates, fats, proteins enzymes. Prerequisite: Approval of instructor. Three hours laboratory. Credit, 1 hour.

467g*, 468g *General Biochemistry Laboratory.* Chemistry of biological compounds, with emphasis on metabolic transformations of proteins, carbohydrates, and fats. Corequisites: CH 461 with 467; 462 with 468. One conference, 5 hours laboratory. Credit, 2 hours each semester.

480g *Methods of Teaching Chemistry.* Organization and presentation of appropriate content of chemistry; preparation of reagents, experiments, demonstrations; organization of stock rooms, laboratories; experience in problem solving. Prerequisite: Approval of instructor. Credit, 3 hours.

481g *Geochemistry.* Occurrence of elements and isotopes in the earth and principles governing their distribution. Prerequisite: Approval of instructor. Credit, 3 hours. (Same as GL 481.)

501 *Current Topics in Chemistry.* Prerequisite: Approval of instructor. May be repeated for credit. Credit, 1 hour.

511, 512 *Chemistry for In-service Teachers.* An integrated approach to the concepts and principles of chemistry. Prerequisite: Approval of instructor. Credit, 3 hours each semester.

525 *Spectrochemical Methods of Analysis.* Theoretical and practical considerations involving the use of optical instruments for chemical analysis with special emphasis on emission and absorption spectroscopy. Prerequisite: CH 442. Three lectures, 3 hours laboratory. Credit, 4 hours.

526 *X-Ray Methods of Analysis.* Theoretical and practical considerations involving the use of x-ray diffraction and spectroscopy for chemical and structural analyses. Prerequisite: CH 442. Three lectures, 3 hours laboratory. Credit, 4 hours.

527 *Electrical Methods of Chemical Analysis.* Theoretical and practical considerations of polarography, potentiometric, amperometric, and conductometric titrations. Prerequisite: CH 442. Two lectures, 6 hours laboratory. Credit, 4 hours.

528 *Topics in Analytical Chemistry.* Prerequisite: CH 423. Credit, 3 hours.

531 *Theoretical Organic Chemistry.* Reaction mechanisms, structure elucidation, stereoisomerism, conformational analysis. Prerequisites. CH 332, 442. Credit, 3 hours.

532 *Theoretical Organic Chemistry.* Prerequisite: CH 531. Credit, 2 hours.

534 *Heterocyclic Compounds.* Chemistry of organic heterocyclic compounds containing nitrogen, sulfur, and other hetero atoms. Prerequisites: CH 532, 537. Credit, 3 hours.

535 *Carbohydrates.* Prerequisites: CH 532, 537, or approval of instructor. Credit, 3 hours.

536 *Natural Products.* Organic chemistry of such natural products as alkaloids, steroids, terpenes, organic medicinals, and antibiotics. Prerequisites: CH 532, 537. Credit, 2 hours.

537 *Organic Reactions.* Important synthetic reactions of organic chemistry with emphasis on recently discovered reactions of preparative value. Prerequisite: CH 531. Credit, 3 hours.

538 *Polymers.* Chemistry and properties of natural and synthetic polymers. Prerequisite: CH 332. Credit, 2 hours.

541 *Chemical Thermodynamics.* Classical approach. Prerequisite: CH 442. Credit, 3 hours.

542, 543 *Statistical Thermodynamics.* Statistical mechanics applied to chemical problems. Prerequisite: CH 541. Credit, 3 hours each semester.

545 *Nature of the Chemical Bond.* The principles of quantum theory applied qualitatively to chemical bonding and molecular structure. Prerequisite: CH 442. Credit, 3 hours.

546, 547 *Quantum Chemistry.* Principles of quantum mechanics applied quantitatively to problems of chemical interest. Prerequisite: Approval of instructor. Credit, 3 hours each semester.

548 *Chemical Kinetics.* Kinetic theory and rate processes. Prerequisite: Approval of instructor. Credit, 3 hours.

549 *Topics in Physical Chemistry.* Prerequisite: Approval of instructor. Credit, 3 hours.

553 *Inorganic Chemistry.* Principles of modern inorganic chemistry and their applications over the entire periodic system. Prerequisites: CH 442, 451, or their equivalents. Credit, 3 hours.

554 *Advanced Inorganic Chemistry.* Elaboration and extension of the more important topics of CH 553. Prerequisite: CH 553. Credit, 3 hours.

556 *Topics in Inorganic Chemistry.* Prerequisite: CH 553. Credit, 3 hours.

563 *Biochemistry.* Proteins with special reference to the enzymes and their mechanism of action. Prerequisite: CH 462. Credit, 3 hours.

565 *Biochemical Techniques.* Application of recent techniques of isolation and analysis to biochemical materials and processes. Prerequisites: CH 225, 461. One lecture, 1 quiz, 5 hours laboratory. Credit, 3 hours.

581 *Isotope Geochemistry.* Geochemistry and cosmochemistry of stable and radioactive isotopes; geochronology; isotope equilibria. Prerequisite: Approval of instructor. Credit, 3 hours.

582 *Topics in Geochemistry and Cosmochemistry.* Topics of current interest for students in chemistry and other fields. A broad sampling of data and thought concerning phase equilibria, element distribution, meteorites, the earth, and other planets. Prerequisite: Approval of instructor. Credit, 3 hours.

*In each of the following groups, credit is allowed for one course only: CH 111 or 113; CH 114 or 115; CH 225 or 327; CH 231 or 331; CH 336 or 338; CH 341 or 441; CH 443 or 444; CH 446 or 447; CH 446 or 448; CH 461 or 464; CH 465 or 467.

EDUCATION

DEPARTMENTAL MAJOR TEACHING FIELD REQUIREMENTS— BACHELOR OF ARTS IN EDUCATION DEGREE CURRICULUMS

Major Teaching Fields required under the secondary curriculum offered by the College of Education, leading to the degree of Bachelor of Arts in Education, are offered in the departments of the College of Liberal Arts, the College of Business Administration or the College of Engineering Sciences. Consult the appropriate departments for statements of these requirements.

DEPARTMENTAL GRADUATE PROGRAMS—

The departments of the College of Education offer programs leading to the degrees of Master of Arts in Education, Education Specialist, Doctor of Education and Doctor of Philosophy.

ELEMENTARY EDUCATION

PROFESSORS Bullington (Ed 412H), Boyd, Doyle, Lewis, Manning, O'Beirne, Podlich; ASSOCIATE PROFESSORS Blackham, Byers, Chronister, Jones, Silvaroli; ASSISTANT PROFESSORS Boetto, Crouch, Dudek, Fare, Hollingsworth, O'Brien, Olmsted; INSTRUCTORS Christine, Edwards, Johnson, Lee, Nelson, Wheelock

ELEMENTARY EDUCATION

EE 211 *Children's Literature.* Survey of modern and folk literature for elementary school children; elements that make a good book for children; techniques for promoting appreciation of literature. Provides background for supplementary material in all areas of the school curriculum. Credit, 3 hours.

212 *Creative Activities for the Young Child.* Emphasis on sensory-perceptual experiences through story telling, rhythms and play activities. Opportunities to observe play behavior of children from two to nine in laboratory situations. Credit, 3 hours.

311 *Social Studies in Early Childhood Education.* Emphasizes the development of democratic living in all areas of the curriculum. Considers in detail objectives, unit planning, problem solving, selection of content, scope and sequence, construction of instructional material, and resources. Provides for experiences with young children. Credit, 3 hours.

312 *Nursery-Kindergarten Education.* Considers all aspects of curriculum. Philosophy, principles, practices, problems, and evaluation in the integrated experience program. Prerequisite: EE 311. Credit, 3 hours.

313 *Child Development.* The major principles underlying the total development of the child during the pre-school and elementary school years with observations in school settings. Emphasis is given to the enhancement and

understanding of the child in the physical, intellectual, social and emotional areas of development. Credit, 3 hours.

314 *The Teaching of Reading.* Reading for the classroom teacher, involving the application of expanding resources in the solving of reading problems. Designed primarily for classroom teachers in terms of reading techniques, procedures and organizational plans. Prerequisite: Admission to the elementary teacher education curriculum. Credit, 3 hours.

322 *Language Arts in Early Childhood Education.* Factors affecting growth in language arts areas; instructional methods and materials in teaching reading, speech, listening, and writing. Proficiency in handwriting required. Credit, 3 hours.

333 *Language Arts in the Elementary School.* Factors affecting language development: Instructional methods and materials for teaching of listening, speaking, and writing with emphasis upon the middle and upper elementary grades. Proficiency in handwriting required. Credit, 3 hours.

344 *Elementary Curriculum.* Curriculum types or designs, persistent curriculum problems, characteristics of excellent programs. Prerequisite: Admission to the elementary teacher education curriculum. Credit, 3 hours.

355 *Social Studies in the Elementary School.* The core function of social studies, scope and sequence, unit organization, methods of instruction, materials and resources for learning. Credit, 3 hours.

366 *Observation and Participation in the Elementary School.* Provides an opportunity for students to observe and work directly with elementary children in a classroom situation. Includes a critical evaluation of the student's experiences. Credit, 3 hours.

411g *Teaching in the Kindergarten.* Origin, organization and administration of kindergartens, equipment and supplies; philosophical and psychological foundations; community resources; gathering and preparing learning materials. Credit, 3 hours.

433g *Phonics and Lower Elementary Reading.* Instruction in word recognition and comprehension; understandings which are related to developmental and corrective programs. Techniques of individual reading, testing and various approaches to the teaching of reading in the elementary school are emphasized. Prerequisite: EE 314. Credit, 3 hours.

451g *Current Reading Practices.* Special consideration given to the implementation of selected factors for classroom practice. Credit, 3 hours.

452g *Production of Reading Aids.* Production and correlation of tape recordings, individual reading laboratories, phonetic devices and self-instructional devices. Credit, 3 hours.

466g *Reading in the Upper Elementary Grades.* Acquaints the special reading teacher and/or the subject matter teachers at upper grade levels with the procedures and the understandings needed to teach reading at these levels. Prerequisite: EE 314. Credit, 3 hours.

478 *Directed Teaching in the Elementary School.* The relationship of theory and practice in methods of teaching; the practice of teaching; practice in guidance, measurement, extra-curricular activities, and classroom management procedures. Prerequisite: Admission to the elementary teacher education curriculum. Credit, 1-10 hours.

479 *Problems of Teachers in the Elementary School.* Individual problems encountered by students in their observations and practice teaching experi-

ences; appraisal of teacher-education backgrounds; bridging of gaps in teacher-education backgrounds. Prerequisite or co-requisite: EE 478. Credit, 3 hours.

481g *Directed Experiences in the Reading Clinic.* Application of Visual-Auditory-Kinesthetic approaches in the treatment of reading problems. Students are expected to work directly with qualified Special Reading Teachers either in the field or in the Reading Center. Prerequisite: Approval of the instructor. Credit, 3 hours.

511 *Elementary Curriculum Development.* Criteria of appraisal, typical curriculum problems, curriculum construction and improvement. Prerequisite: EE 344, or equivalent. Credit, 3 hours.

513 *Child Development.* A continuation and more thorough analysis of the major principles, theories and research concerning the elementary school child and his development. An integrated approach to the study and facilitation of wholesome educational and psychological development. Credit, 3 hours.

522 *Developmental Social Experiences in Early Childhood Education.* Materials, techniques, aesthetic expression, creative activities and values in the integrated curriculum. Credit, 3 hours.

525 *Improving Reading and Language in Early Childhood Education.* Strengths and weaknesses of current programs. Significant problems and trends. Development of a balanced and articulated program of reading. Prerequisite: EE 322 or equivalent. Credit, 3 hours.

526 *Improving Reading and Language in the Upper Elementary Grades.* Strengths and weaknesses of current programs. Significant problems and trends. Development of a balanced and articulated program of reading. Prerequisite: EE 333 or equivalent. Credit, 3 hours.

527 *Improving the Teaching of Arithmetic in the Elementary School.* Strengths and weaknesses of current programs. Significant problems and trends. Development of a balanced and articulated program of arithmetic. Prerequisite: MA 380 or equivalent. Credit, 3 hours.

528 *Improving the Teaching of Social Studies in the Elementary School.* Strengths and weaknesses of current programs. Significant problems and trends. Development of a balanced and articulated program of social studies. Prerequisite: EE 355 or equivalent. Credit, 3 hours.

529 *Improving the Teaching of Science in the Elementary School.* Strengths and weaknesses of current programs. Significant problems and trends. Development of a balanced and articulated science program. Prerequisite: PL 320 or equivalent. Credit, 3 hours.

533 *Evaluation of Children's Literature.* Social and educational concepts expressed in literature and changes in values and principles that are needed. Prerequisite: At least one course in literature. Credit, 3 hours.

544 *Play Education.* Conflicting theories of play and the educational implications of each in a curriculum. A practical application in the lower levels of the elementary school. Credit, 3 hours.

555 *Modern Practices in Early Childhood Education.* Trends and practices, instructional and resource material, methods and techniques in early childhood education. Credit, 3 hours.

556 *Diagnosis and Treatment of Reading Problems.* Diagnostic procedures and understandings involved in evaluating the reading achievement

and capacity of corrective and remedial readers. Screening techniques and case data evaluation are also included. Prerequisite: EE 433g and approval of the instructor. Credit, 3 hours.

557 *Psychological Aspects of Diagnosis and Remediation.* Specific psychological procedures in evaluation of corrective and remedial readers. Emphasis is given to advanced psychological interpretation of case studies, diagnostic procedures and remedial approaches. Prerequisite: EE 433g and permission of the instructor. Credit, 3 hours.

581 *Directed Experiences in the Reading Clinic.* Experience in the College of Education Reading Center enabling the student to assume major responsibility for evaluation, interviewing and reporting findings on corrective and remedial readers. Prerequisite: EE 556 and EE 557. Credit, 3 hours.

711 *History of Curriculum Development in the Elementary School.* Elementary school curriculum from colonial times to the present with concomitant attention to the philosophical assumptions and theories of learning which influenced the selection of content. Prerequisite: EE 511 or equivalent. Credit, 4 hours.

722 *Issues in Elementary Education.* Problems, trends, issues and research in elementary education, and their relationship in modern educational practices. Credit, 4 hours.

SECONDARY EDUCATION

PROFESSORS Fullerton (Ed 406C), Haggerson, Perril, Rice;
ASSOCIATE PROFESSORS Cook, Frasier, Griffith, Kaiser,
Kiesow, Rover; ASSISTANT PROFESSORS Kelly,
Tolbert, Weber, Williamson

SECONDARY EDUCATION

SE 310 *The Secondary School.* Development of American Secondary Education. Controversial viewpoints regarding American Secondary Schools. Challenges confronting secondary school teachers. Observations may be required. Credit, 3 hours.

311 *Principles and Curricula of Secondary Schools.* Principles, purposes, organization and curricula of secondary schools, with a major emphasis upon current curricular materials, trends, and issues. Prerequisites: EF 222 or equivalent, EF 333 or SE 310, and admission to a secondary teacher education curriculum. Credit, 3 hours.

411 *Teaching and Evaluating in Secondary Schools.* Methods, procedures, techniques, and instruments of teaching and evaluating in secondary schools. Prerequisite: EF 222 or equivalent, SE 311, and admission to a secondary teacher education curriculum. Credit, 4 hours.

433 *Directed Teaching in the Secondary School.* The relationship of theory and practice in methods of teaching; practice of teaching; practice in guidance, measurement, extra-curricular activities, and classroom management procedures. Prerequisites: SE 311, 411, and admission to a secondary teacher education curriculum. Credit, 1-10 hours.

444g *The Junior High School.* The development, purposes, organization, curricula, and students of the junior high school, with a major emphasis upon curriculum. Prerequisite: EF 222 or equivalent, and EF 333 or SE 310. Credit, 3 hours.

455g *Core Curriculum Methods and Materials.* The foundations, organization, and present status of the core curriculum. The development and utilization of core materials for classroom instruction. Prerequisite: EF 222 or equivalent, EF 333 or SE 310. Credit, 3 hours.

466g *Safety Education.* Various phases of safety education: home, school, and on-the-job. Emphasis on special interests of class members. Credit, 3 hours.

477g *Driver Education.* The preparation of instructors for the secondary school. Includes the study of the automobile, Arizona laws pertaining to motor vehicles, and behind-the-wheel instruction. Prerequisite: SE 466g and a valid driver's license. Lectures and laboratory. Credit, 3 hours.

488g *Organization and Administration of Driver and Safety Education.* Procedures and planning for the curriculum, organization, and administration of safety education programs. Prerequisite: SE 477. Credit, 3 hours.

522 *Secondary School Curriculum Development.* The social processes, issues, principles, patterns, and procedures in curriculum development. Prerequisites: SE 311, 411, 433. Credit, 3 hours.

533 *Improving Instruction in Secondary Schools.* Analytical appraisal of procedures, methods, techniques, and experimental approaches to teaching in secondary schools. Prerequisite: SE 433 or equivalent. Credit, 3 hours.

544 *Reading Problems in the Secondary School.* Methods for meeting the reading and language problems encountered by junior and senior high school pupils. Prerequisites: SE 311, 411, and 433 or undergraduate major in elementary education. Credit, 3 hours.

555 *Student Activities in the Secondary School.* The development, purposes, and principles of student activities as they are related to the educational program of the secondary school. Prerequisites: SE 311, 411, 433. Credit, 3 hours.

566 *Evaluating Secondary School Programs.* Development of evaluative criteria. Group and individual work in evaluation, using schools and classes of those enrolled as the source of problems for discussion and analysis. Prerequisite: SE 433. Credit, 3 hours.

577 *Recent Issues and Trends in Secondary Education.* Recent committee reports, problems facing American secondary schools, and recent issues. Prerequisite: SE 433. Credit, 3 hours.

588 *Human Relations in the Secondary Schools.* Human relations problems in the school resulting from the interaction of teachers, pupils, administrators, laymen and non-professional staff. Prerequisite: SE 433. Credit, 3 hours.

711 *Secondary Curriculum Development.* Factors bearing upon the development of a qualitative learning environment in the secondary school; the evaluation of research and the individual study of fundamental problems in secondary curriculum development. Prerequisites: SE 433, 522. Credit, 4 hours.

722 *Improvement of Instruction in the Secondary School.* Factors bearing upon the improvement of instruction in the secondary school; the evaluation of research and the individual study of fundamental problems in the

improvement of instruction in the secondary school. Prerequisites: SE 433, 533. Credit, 4 hours.

ADULT EDUCATION

AE 433g *Family Education in the Schools.* Development, content, and considerations of teaching marriage and family courses in the public schools. Prerequisite: Approval of the instructor. Credit, 3 hours.

455g *Education of Migrants.* The special problems and considerations in educating migrant families. Prerequisite: Approval of instructor. Credit, 3 hours.

511 *Adult Education.* The historical development, objectives, scope, trends, and significance of adult education. The philosophy and trends of adult education in relation to desirable present and future local public school programs. Credit, 3 hours.

512 *Curriculum Development and Program Planning in Adult Education.* The factors considered in establishing and developing an adult education program in secondary schools, colleges and universities. Prerequisite: AE 511. Credit, 3 hours.

522 *Educating the Middle Age and Older Person.* The educational considerations and methods utilized in each of the principal age groupings of adults. Prerequisite: Approval of the instructor. Credit, 3 hours.

555 *Inter-Cultural Education.* The administration and organization of inter-cultural education for interchanges and technical assistance of higher education in other countries. Credit, 3 hours.

566 *International Education.* Education in the world community with special reference to cross-cultural problems of foreign students preparing for teaching abroad. Credit, 3 hours.

711 *Adult Education.* Existing types, methods, and administration of adult programs. Emphasis is given to ways and means of implementing adult activity and to the use of adult activity in the study and improvement of educational services provided in local communities. Each student will participate in a research study of some area of adult education. Credit, 4 hours.

EDUCATIONAL ADMINISTRATION AND SUPERVISION

PROFESSORS WOCHNER (Ed 404B), ASHE, DEEVER, MENKE,
NEWBURN, WOOTTON; ASSOCIATE PROFESSORS
HUNNICUTT, DEMEKE

EDUCATIONAL ADMINISTRATION AND SUPERVISION

EA 466g *School-Community Relationships.* Principles, philosophy, and techniques for improving the educational program through school-community action. Special attention given to the role of all school personnel in coordinating school-community experiences. Credit, 2 hours.

477g *School Law.* Constitutional, statutory, and case law that relates to all school personnel, pupils, the school district and other governmental units. Study of contracts, dismissals, tenure, retirement, pupil injuries, liability of personnel and district, school district boundary changes, and bonding. Credit, 3 hours.

522 *Public School Administration.* The history and development of public school administration in the United States, current organizational patterns for public education at local, county, state and national levels; the administrator's responsibilities in all phases of education. Credit, 4 hours.

533 *Instructional Leadership in the Elementary School.* Curricular practices and the processes used by administrative and supervisory leaders who plan, organize, and coordinate the professional activities of elementary school teachers in improving pupil-learning experiences. Prerequisite: EE 511. Credit, 3 hours.

535 *Instructional Leadership in the Secondary School.* Curricular practices and the processes used by administrative and supervisory leaders who plan, organize, and coordinate the professional activities of secondary school teachers in improving pupil-learning experiences. Prerequisite: SE 522. Credit, 3 hours.

544 *Public School Finance.* School budget procedures, accounting, revenues, state and county finance, and problems relating to financing public education. Prerequisite: Admission to Educational Administration program. Credit, 3 hours.

555 *School Plant Planning and Maintenance.* School building needs, educational planning for facilities, responsibilities of architects, duties of contractors, the equipping and furnishing of school buildings. Prerequisite: Admission to Educational Administration program. Credit, 3 hours.

566 *Human Relationships in Educational Administration.* The administrator's professional relationships with teachers, parents, pupils, and other educational leaders within the district. Factors in human relationships including communication skills, morale, authority, and perception through the case approach. Prerequisite: Admission to Educational Administration program. Credit, 3 hours.

568 *Supervision of Student Teaching.* Experiences and content for those planning to become supervisors of student teaching in teacher education programs. Also serves as in-service training for those already working in student teaching. Credit, 2 hours.

571 *School Business Management.* Purchasing, budgeting, accounting, payroll management, auditing, financial reporting, insurance, and administration of non-teaching personnel and services. Prerequisite: EA 544. Credit, 3 hours.

573 *School Personnel Administration.* Organization for personnel services; development of policy to govern selection, orientation, placement, remuneration, transfers, separations; and development of morale among instructional and non-instructional personnel. Prerequisite: Admission to Educational Administration program. Credit, 3 hours.

577 *Elementary School Principalship.* Problem and laboratory approaches used to provide application of administrative principles and procedures to the administrative activities of elementary school principals. Prerequisites: Admission to Educational Administration program and EA 533. Credit, 3 hours.

578 *Secondary School Principalship.* Problem and laboratory approaches used to provide application of administrative principles and procedures to the administrative activities of secondary school principals. Prerequisites:

Admission to Educational Administration program and EA 535. Credit, 3 hours.

611 *Interdisciplinary Forces Affecting Educational Administration.* The inter-related nature of educational administration and the behavioral sciences. Prerequisites: 15 semester hours Educational Administration. Credit, 3 hours.

622 *Public School Surveys.* The history and development of public school surveys, with a critical study of current practices, trends, and objectives. Practical experience provided in collecting and preparing survey data. Prerequisites: EA 522 and six additional hours in school administration. Credit, 2 hours.

675 *State and County School Systems.* The function and responsibilities of state departments of education, of county or other intermediate districts. Prerequisite: Admission to Educational Administration program. Credit, 2 hours.

711 *Administrative Leadership.* Recent research pertaining to the administrative relationships with people. Emphasis given to teaching personnel, classified personnel, boards of education, and individuals or groups in the community. Prerequisite: 30 semester hours Educational Administration, or approval of instructor. Credit, 4 hours.

722 *Administration of Instructional Improvement.* Investigation of recent research relating to administrative and supervisory responsibilities for the improvement of the educational program. Emphasis on effective processes by administrators, supervisors, consultants, and coordinators. Prerequisite: 30 semester hours Educational Administration, or approval of instructor. Credit, 4 hours.

733 *Administrative Management.* Recent research relating to school management. Emphasis given to the areas of school finance, law, building, transportation, food services, and supply management. Prerequisite: 30 semester hours Educational Administration, or approval of instructor. Credit, 4 hours.

HIGHER EDUCATION

HE 522 *Introduction to Higher Education.* General introduction and orientation to the broad field of higher education. Credit, 3 hours.

611 *Curriculum and Instruction in the Junior College.* The issues, principles, patterns and procedures in the development of the curriculum of the junior college; factors bearing upon the improvement of instruction in the junior college. Credit, 3 hours.

622 *Curriculum and Instruction in Higher Education.* Current issues and trends in curriculum and instruction in the field of higher education. Credit, 3 hours.

679 *Administration of the Junior College.* The organization and administration of junior (community) colleges with emphasis upon practices and problems encountered in their operation. Credit, 3 hours.

689 *Administration of Higher Education.* Intensive study of the theory and practice of administrative leadership in institutions of higher education. Credit, 3 hours.

COUNSELING AND EDUCATIONAL PSYCHOLOGY

PROFESSORS DAVIS (415C), BAKER, HEIMANN, HELMSTADTER,
NICHOLS, RICHARDSON, H.D., SCHUTZ, STOUT, WRENN;
ASSOCIATE PROFESSORS COMBS, DAANE,
FAUST, GAFFNEY, STAFFORD; ASSISTANT
PROFESSORS HAMM, SULLIVAN,
VAN WAGENEN; INSTRUCTOR BLOYER

COUNSELOR EDUCATION

CE 412g *Principles of Student Personnel Work.* The areas of student personnel work with consideration of the interrelation of the various school services and community agencies. Credit, 3 hours.

422g *Personality Development.* Interaction of emotional and cognitive factors in personality development at different age levels in personal life, and in school situations. Various personality theories examined. Credit, 3 hours.

523 *Psychological Tests.* Standardized tests in the study of the individual with emphasis on test score interpretation in counseling. Prerequisite or corequisite: CE 412g, 422g. Credit, 3 hours.

534 *Occupations and Careers.* The world of work, value climates and job classification systems, educational and training criteria regarding occupational entry and vertical mobility. Prerequisite or corequisite: CE 412g and 422g. Credit, 3 hours.

545 *Analysis of the Individual.* Non-standardized techniques in the analysis of the individual with emphasis on the interpretation of case study data. Prerequisite or corequisite: CE 412g, 422g. Credit, 3 hours.

567 *Group Procedures.* Principles and techniques of group procedures other than counseling as used in the school program. Prerequisites: CE 523, 534, 545. Credit, 3 hours.

611 *Counseling.* Principles and application of counseling with particular emphasis on the counseling interview. Prerequisite: CE 567. Credit, 3 hours.

622 *Group Counseling.* Principles and application of group counseling techniques. Prerequisite or corequisite: CE 611. Credit, 3 hours.

633 *Organization and Administration of Student Personnel Programs.* Organizational procedures and patterns, and administrative relationships in student personnel programs. Prerequisite or corequisite: CE 611 and 622. Credit, 2 hours.

644 *Psychology of Careers.* Structural and developmental theories regarding patterns of occupational choice. The role of counseling in the career planning function. Prerequisite: CE 633. Credit, 3 hours.

655 *Student Personnel Work in College and University.* Historical development and present status in relation to changing concepts and functions in higher education—junior college, college and university. Observation on college campuses. Prerequisite or corequisite: Experience or coursework in higher education. Credit, 3 hours.

681 *Supervised Practice.* Assignment in a school or community agency for supervised experiences in personnel work. Prerequisite: Approval of instructor. Credit, 2-6 hours.

711 *Advanced Counseling.* Emphasis upon applied technique and tape analysis. Procedures and structure of counseling-pacing, communication, empathy, and the helping relationship. Prerequisite: CE 611. Credit, 3 hours.

722 *Philosophies and Theories of Counseling.* Philosophical and psychological assumptions of various counseling approaches and various vocational development theories. Implications for school and college counseling situations of each major counseling approach. Prerequisite: CE 611. Credit, 3 hours.

EDUCATIONAL PSYCHOLOGY

EP 411g *Educational Measurements and Evaluation.* Evaluation techniques and group tests of ability and achievement with special emphasis upon the interpretation and use of test results in the improvement of instructional and administrative procedure. Credit, 3 hours.

422 *Educational Psychology.* Psychology facts and laws particularly relevant to the problems of education. Prerequisite: 1-PY 100. Credit, 3 hours.

433g *Educational Statistics.* Designed as a terminal course for education majors not going on for advanced study, and as an introductory course for education majors at the graduate level. Descriptive statistics, the normal curve, introduction to chi square and correlational techniques, and the presentation and interpretation of statistical data in educational literature. Credit, 3 hours.

444g *Mental Health and Educational Practice.* Social and emotional adjustment with emphasis on the influence of educational practice on personality development. The role of the teacher in the identification of pupil adjustment mechanisms and methods for handling behavior disorders. Prerequisites: 1-PY 112; EP 422. Credit, 3 hours.

511 *Educational Psychology.* The psychological basis of education; development of human abilities; individual differences; the relationship of school activities to personality development; and introduction to learning and transfer of training. Prerequisites: EP 422 or equivalent; EF 222 or equivalent. Credit, 3 hours.

513 *Psychology of the Elementary School Child.* The mental, physical, social, and emotional development of children during early, middle and late childhood with emphasis on the application of psychological theory to problems of teaching in the elementary school. Prerequisites: 1-PY 112; EP 422. Credit, 3 hours.

514 *Psychology of the Adolescent.* Mental, physical, social, and emotional development in adolescence with emphasis on the influence of various aspects and activities of the secondary school on adolescent development. Prerequisites: 1-PY 112; EP 422. Credit, 3 hours.

515 *Psychology of Teaching Adults.* Psycho-educational problems in teaching the adult learner with special emphasis on individual differences, remedial procedures and adjustment problems of the adult. Prerequisites: 1-PY 112; EP 422, 511. Credit, 3 hours.

522 *School Learning and Motivation.* Theories of learning and experimental investigations in the field of human learning and motivation with special emphasis on their applications to teacher-learning situations in the school. Prerequisite: EP 511. Credit, 3 hours.

523 *Automated Instructional Techniques.* The application of psychologi-

cal principles to the automatization of certain instructional processes. Principles of self-instructional programming, the development, revision, and testing of programmed learning sequences, and a study of the available devices and systems are emphasized. Prerequisites: 1-PY 112; EP 511, and approval of instructor. Credit, 3 hours.

525 *Individual Measurements in Education.* Individual test administration and experience in interpreting the results of the test to school personnel. Prerequisites: EP 411, 511, and approval of instructor. Credit, 3 hours.

528 *Diagnosis of Learning Disabilities.* Clinical diagnosis of learning disabilities emphasizing specific academic problems. Use and interpretation of diagnostic instruments in practical school situations. Prerequisites: EP 411, 511, and 525. Credit, 3 hours.

533 *Statistical Methods in Education.* Appropriate statistical methods for analyzing educational data. Probability and small sample theory, chi square, correlation-regression techniques, analysis of variance, discriminant analysis and analysis of co-variance. Prerequisite: EP 433. Credit, 3 hours.

541 *Measurement Techniques in School Personnel Selection and Placement.* Development of test procedures in the operation of a school personnel selection and placement testing program. Job description and analysis, test selection and development, construction and analysis of new tests, methods of estimating validity and methods of including non-test variables in the prediction of job success are emphasized. Prerequisites: EP 411, 433, and approval of instructor. Credit, 3 hours.

543 *Theory and Practice in Test Construction.* Fundamental theory of test construction and the application of this theory to the preparation of tests. Theoretical treatment of reliability, validity, scaling, norming and item selection. Practical exercises in writing and editing test items, and assembling complete tests. Prerequisites: EP 411, 433. Credit, 3 hours.

544 *Appraisal and Evaluation Techniques.* Factors involved in the construction of tests—formal and informal, old and new types. Practice in discovering and formulating objectives and in constructing techniques for ascertaining the extent of achievement of these objectives. Prerequisites: EP 411, 433, 543. Credit, 3 hours.

555 *Factor Analysis and Techniques of Data Processing.* Theory and methods of computation in factor analysis, application of modern data processing methods to large sample researches, group testing programs, and pupil accounting. The coding and analysis of the mass data collected in such studies, using punch card procedures. Prerequisites: EP 411, 433, or equivalents. Credit, 3 hours.

562 *Psychology of Exceptionality.* General psychological theory and experimental research relevant to exceptionality with emphasis on implications for educational programs which take cognizance of unique learner characteristics. Prerequisite: EP 511. Credit, 3 hours.

564 *Psychology of Reading.* A behavioral analysis of the reading process and application of experimentally derived principles of learning and behavior in reading instruction and research. Prerequisite: EP 511. Credit, 3 hours.

566 *Recent Studies in Educational Psychology.* A critical psychological analysis of school activities emphasizing what the literature has to say about application of current personality theory to the educative process. Prerequisite: Six hours of Educational Psychology. Credit, 3 hours.

711 *Educational Psychology.* Theory and research in educational psychology, and their implications for educational practice. Credit, 4 hours.

EDUCATIONAL FOUNDATIONS

PROFESSORS RALSTON (Ed 414D), HOOVER, JELINEK, MCGRATH, MOORE, SHOFSTALL, SUNDWALL, WEISS; ASSOCIATE PROFESSORS ABBOTT, BARTL, BAUMANN, BELOK, BONTRAGER, KINGSBURY, MEADOR, MITCHELL, SKELTON, WALRAFEN; ASSISTANT PROFESSORS MORRIS, OSWALT; INSTRUCTOR CUMMINGS

EDUCATIONAL FOUNDATIONS

EF 111 *Exploration of Education.* Education as an instrument in the development of the individual and society; its significance as an American institution. Credit, 3 hours.

222 *Psychological Foundations of Education.* Childhood and youth; physical, motor, intellectual, social, emotional and moral development of students, and the observing, recording, and interpreting of human behavior; functional concepts of learning; modern theories of education. Prerequisite: EF 111. Credit, 3 hours.

333 *Issues in Teaching.* Educationally significant historical, philosophical, psychological, and sociological issues through the methods of science. Prerequisite: EF 222. Credit, 3 hours.

411g *General Semantics in Education.* Demonstrations, research, intensive reading in original documents and applications in general semantics. Prerequisites: EF 111, 222, 333; PI 101, and/or approval of instructor. Credit, 3 hours.

611 *Psychological Foundations of Education.* Educational psychological theory applied to problems involved in the educative process. Credit, 3 hours.

622 *Contemporary Education.* Critical, student-centered research into the dominant movements in contemporary education in America; the semantic-cultural-ideological bases of these movements. Prerequisites: SF 433 or 522, or 544 and approval of instructor. Credit, 3 hours.

SOCIAL AND PHILOSOPHICAL FOUNDATIONS

SF 411g *History of American Education.* The social life, ideas, and institutions that have given direction to education in the United States. A background for understanding and evaluating present educational problems. Credit, 3 hours.

422g *Educational Sociology.* Education in relation to social institutions. Considers methods of gathering data in social research, the family, problems of educational reconstruction, social relationships, and social measurements. Credit, 3 hours.

433g *Philosophy of Education.* The philosophical foundations of contemporary educational ideas. Introductory considerations for the development of a philosophy of education. Credit, 3 hours.

511 *School and Society.* The interrelationship of school and society and the place of education in social change. Prerequisite: EF 333 or SF 433. Credit, 3 hours.

522 *Education and Democratic Values.* Education as a moral enterprise in which the school seeks to cultivate selected values by the subject matter and methods it employs in its program. Prerequisite: EF 333 or SF 433. Credit, 3 hours.

533 *Comparative Education in the Western World.* The educational systems and ideas of the leading nations of western Europe, the Soviet Union, and the British Commonwealth, with implications for education in the United States. Prerequisite: EF 333 or SF 433. Credit, 3 hours.

534 *Comparative Education in Asia, Africa, and Latin America.* Educational goals and methods for the technologically underdeveloped regions. Educational systems and ideas in Latin America, Asia, and Africa. Implications for education in the United States. Prerequisite: EF 333 or SF 433. Credit, 3 hours.

544 *Philosophic Foundations of Education.* The major points of view in contemporary educational thought, with considerable emphasis on the basic issues in general philosophy which are foundational to philosophies of education. Prerequisite: EF 333 or SF 433. Credit, 3 hours.

555 *Education Classics.* Selected documents from the past for the purpose of finding useful suggestions for dealing with present educational problems. Prerequisite: EF 333 or SF 433. Credit, 3 hours.

566 *History of Education.* The development of educational institutions and ideas in the Western World, from ancient times to the twentieth century. Prerequisite: EF 333 or SF 433. Credit, 3 hours.

711 *Social and Historical Foundations of Education.* A critical examination of the characteristics and problems of modern American education and the social and historical context from which they have emerged. Prerequisite: SF 544. Credit, 4 hours.

722 *Recent Developments in Philosophy of Education.* Trends in contemporary educational thought. Prerequisite: SF 544. Credit, 4 hours.

EDUCATIONAL SERVICES

PROFESSORS Abraham (Ed 402C), Benedict, Roessel, Vergis; ASSOCIATE PROFESSORS Gerlach, Hensley; ASSISTANT PROFESSOR Card

AUDIO-VISUAL EDUCATION

AV 411g *Audio-Visual Materials and Procedures in Education.* The role of learning and communication principles in the selection and/or preparation, evaluation and utilization of materials and equipment in instructional contexts. Heavy emphasis is placed on a variety of practical instructional technological developments in education. Two lectures, 3 hours laboratory. Credit, 3 hours.

412g *Audio-Visual Practices.* Exploration in depth of selected areas emphasized in AV 411. Prerequisite: AV 411. Credit, 2 hours.

422g *Radio and Television in Education.* For students and teachers interested in making more effective use of radio and television broadcasts in the classroom situation. Designed to acquaint teachers with the possibilities available and the means of adapting materials for learning experiences. Credit, 3 hours.

511 *Photography in Public Education.* A laboratory course in the fundamentals of photography and darkroom procedure. For the teacher who wishes to use photography in preparing instructional materials. One lecture, 3 hours laboratory. Credit, 2 hours.

522 *Production of Audio-Visual Materials.* Making of photographs, slides, filmstrips, motion pictures, and recordings. Preparation of scripts. Technical problems of production. Prerequisite: AV 511. One lecture, 3 hours laboratory. Credit, 2 hours.

533 *Administration of Audio-Visual Programs.* The qualifications and duties of the director, preparing the budget, buying equipment, handling materials, in-service training, and evaluation of the program. Credit, 2 hours.

544 *Graphic Arts in Education.* Perception and learning theory as they apply to communication in educational situations involving graphic material selection, evaluation, application and preparation. The latter includes: layout planning, mechanical lettering, transparency making, photo copying and allied methods of graphic duplicating processes. Prerequisite: AV 411 or equivalent. Credit, 3 hours.

555 *Educational Television.* Designed to acquaint teachers with methods of teaching via television. Planning, preparation, and production of telecourses. Credit, 3 hours.

INDIAN EDUCATION

IE 311 *Indian Education.* Foundations and history of Indian education and present day implications. Credit, 3 hours.

322 *Methods and Materials for Teaching Indian Children.* Materials and methods particularly suited to the education of Indian students. Effective use of local and tribal materials in the classroom. Experimentation with new ideas provided. Credit, 3 hours.

333 *Curriculum and Practices for Indian Education.* Curriculum problems and recommended practices for Indian education. Review of past and present Bureau of Indian Affairs and public school curriculums. Specific techniques examined for curriculum improvement in Indian education. Credit, 3 hours.

425g *Educational Applications in Anthropology.* Education and its relation to anthropology. Values and implicit cultural assumptions with their impact on education. Use of case study approach in understanding the influence of social and cultural factors in the educative process. Credit, 3 hours.

490g *Problems of Teachers of Indian Children.* Current issues, trends and general problems encountered by teachers of Indian children. Oral English, written English, and reading receive special emphasis. Current research reviewed and evaluated. Credit, 3 hours.

511 *School-Community Relations in Indian Education.* Specific techniques and methods utilized in realizing harmonious and effective relations between the school with Indian children and the community in which these children live. Credit, 3 hours.

522 *Education of Indian Adults.* Methods used to establish Indian adult education; principles involved in determining course selection and course

content; successful Indian adult education programs and their essential ingredients. Credit, 3 hours.

533 *Guidance for the Indian Student.* Problems faced in providing adequate guidance services for Indian students and the necessity for cultural understanding in guidance. Consideration given to the effect of tribal values and their relationship to effective guidance. Credit, 3 hours.

544 *Community Development in Indian Education.* Methods and techniques for initiating community development programs in Indian communities; the role and responsibilities of school personnel, community leaders, and individuals. Credit, 3 hours.

SPECIAL EDUCATION

SP 301 *Mental Retardation.* Nature and characteristics of mental retardation in children and adults. Emphasis on appropriate techniques of instruction, training, and therapy. Credit, 3 hours.

302 *Participation with Mentally Retarded Children.* Clinical and laboratory experience with the mentally retarded in cooperating clinics, institutions, schools, and agencies. Prerequisite: SP 301 or approval of instructor. Credit, 3 hours.

311 *Orientation to Education of Exceptional Children.* Exceptional child categories, including gifted, mentally retarded, sight, hearing, speech, emotionally disturbed, and others. This orientation will include observation of exceptional children in classroom situations. Credit, 3 hours.

321 *Methods, Materials, and Curricula for Mentally Retarded Children.* Methods, materials, and curricula suitable for the mentally retarded. Stresses educational procedures currently useful at elementary and secondary levels. Prerequisites: SP 301, 302, 311. Credit, 3 hours.

404g *Psychological, Social, and Health Aspects of Mental Retardation.* The multidisciplinary approach to the problem of mental retardation in children. Contributions to it are made by well-qualified persons in the fields of pediatrics, psychology, social work, and public health nursing. Credit, 2 hours.

436g *Emotional Problems and the Classroom Teacher.* An understanding of the emotional difficulties of the child in the regular classroom. The meaning and development of the most common maladaptive patterns will be considered and methods by which the teacher can assist the child and his family will be emphasized. Credit, 3 hours.

446g *The Culturally Deprived Child.* The deprived child in terms of his physical, social, economic, psychological, and educational needs. Material from all the major disciplines will be used to help understand the child and his problems. Credit, 3 hours.

455g *Education of the Hearing-Handicapped.* Curriculum and techniques in pre-schools, primary and intermediate levels. Consideration of the psychological correlates of hearing handicaps and their effect upon the child, the family, and the community. Philosophy and methods of language and speech development. Credit, 3 hours.

456g *Education of the Hearing-Handicapped.* Language and speech development, reading techniques and the teaching of elementary subjects to the hearing-handicapped. Prerequisite: SP 455. Credit, 3 hours.

522 *Experience in Exceptional Child Clinics.* Provides experience with exceptional children in cooperating clinics, organizations, and institutions in Arizona which work with mentally retarded, orthopedic, sight, speech, hearing, bilingual, and other areas in special education. Pre-registration necessary. Prerequisites: SP 511 and teaching experience. Credit, 6 hours.

523 *Participation with Gifted Children.* Intensified study and participation with gifted children in either a campus or community setting. The course will be organized around both a college class for background study and research and a special class of gifted children. Prerequisites: SP 511 or experience in working with exceptional children in this category, and teaching experience. Credit, 6 hours.

524 *Participation with Cerebral Palsy Children.* Intensified study and participation with cerebral palsy children in either a campus or community setting. This course will be organized around both a college class for background study and research and a special class of cerebral palsy children. Prerequisites: SP 511 or experience in working with exceptional children in this category, and teaching experience. Credit, 6 hours.

533 *The Bilingual Child.* Spanish-American and Indian children, including their educational needs, materials and methods appropriate to their backgrounds and language problems. Credit, 3 hours.

544 *The Orthopedically Handicapped Child.* Orthopedically handicapped children, including their needs and characteristics, appropriate materials and teaching methods, teacher qualifications, educability, definitions, and terminology. Among the specific categories to be covered in this course are children with orthopedic, cardiac, tubercular, and glandular handicaps. Credit, 3 hours.

555 *The Child with Hearing Problems.* Children with hearing disabilities of either a partial or complete nature, including their needs and characteristics, appropriate materials and teaching methods, teacher qualifications, educability, definitions, and terminology. Study of the hearing-handicapped child in the regular classroom situation and in special classes. Credit, 3 hours.

566 *The Visually Handicapped Child.* Visually handicapped children, including their needs and characteristics, appropriate materials and teaching methods, teacher qualifications, definitions, and terminology. Credit, 3 hours.

577 *The Mentally Retarded Child.* Mentally retarded children, appropriate materials and methods, teacher qualifications, educability, and special problems. Credit, 3 hours.

578 *Educational Procedures in Mental Retardation (Curriculum, Materials and Methods.)* Teaching the mentally retarded child, with emphasis on specific methods, materials of instruction, and curriculum development. Meets state requirement for Special Education methods. Prerequisite: SP 577 or approval of instructor. Credit, 3 hours.

588 *The Gifted Child.* Gifted children, including their needs and characteristics, appropriate materials and methods, and teacher qualifications. Emphasis is placed on the techniques and values related to acceleration, enrichment, and special classes, and to the research of Terman, Hollingworth, Witty, and others. Credit, 3 hours.

See related course: 1-SE 420g *Speech Correction for the Classroom Teacher.*

LIBRARY SCIENCE

PROFESSOR Batchelor (Ed 410C), Covey; ASSISTANT PROFESSOR Moffit

LIBRARY SCIENCE

LS 313 *Library in the Modern School.* A classroom teacher's introduction to school library materials, organization and services. Special emphasis on most frequently used ready-reference materials and on procedures for using the library in teaching. No credit on Library Science minor. Credit, 3 hours.

323 *Books, Libraries, and Society.* The history of books and libraries as related to society. Objectives and varieties of contemporary library service; leaders and organizations in professional perspective. Credit, 3 hours.

441g *Dewey Decimal Classification.* The principles and applications of subject classification, assigning of Cutter numbers and subject tracings, and the compiling of the shelf list. One lecture, 3 hours laboratory. Credit, 2 hours.

442g *Descriptive Cataloging.* The purpose and principles of cataloging library materials with emphasis upon the use of both printed and typewritten cards. One lecture, 3 hours laboratory. Credit, 2 hours.

461g *Library Book Selection.* Criteria, problems, and policies in the selection of books for the school and public library. Attention given to guides and aids, publishers, dealers, and reading interests. Credit, 2 hours.

463g *Library Materials for Children.* Books and related materials for children's libraries and for the elementary school program. Criteria for selection and procedures for integrating vital materials into the school curriculum and/or free-reading program in both the school and public library. Prerequisite: LS 461 or approval of instructor. Credit, 3 hours.

464g *Library Materials for Adolescents.* Books and related materials for youth libraries and for the secondary school program. Criteria for selection and procedures for integrating vital materials into the school curriculum and/or free-reading program in both the school and public library. Prerequisite: LS 461 or approval of instructor. Credit, 3 hours.

471g *Basic Reference Resources.* Content and use of the basic types of ready-reference works such as dictionaries, encyclopedias, yearbooks, biographical dictionaries, geographical sources, directories of agencies, handbooks, manuals, serials, indexes, bibliographies, government publications and audio-visual sources. Credit, 3 hours.

481g *Library Administration.* Organization and administration of the school and small public library, its backgrounds, activities, functions, personnel, materials, and equipment. Prerequisites: LS 441, 442, 461, 471, or approval of instructor. Credit, 3 hours.

493g *Library Science Workshop.* Selected library problems, directed by the regular staff and/or visiting specialists. For in-service librarians with no fewer than 15 credits in Library Science. Others by approval of the instructor. Credit, 3-6 hours.

511 *Cataloging Administration.* Problems related to contemporary cataloging, its structure and purpose as a function in library administration. Prerequisites: LS 441 and 442. Credit, 2 hours.

522 *Bibliography in Subject Fields.* Critical evaluation of the most frequently used reference materials in the humanities, the sciences, and the

social sciences. Prerequisite: LS 471 or approval of instructor. Credit, 3 hours.

533 *Current Library Problems.* Professional reading and discussion on current issues in librarianship as related particularly to supervision in school districts and/or public library systems. Prerequisite: LS 481 or approval of instructor. Credit, 2 hours.

544 *Reading and Communication.* The integration of instructional materials with classroom procedures. Methods for teaching library skills. Reader guidance techniques and the total reading program of the school. Credit, 3 hours.

CHEMICAL ENGINEERING

PROFESSORS CASTLE O. REISER (EC G136B), NUTT; ASSOCIATE
PROFESSOR CRAIG; ASSISTANT PROFESSORS
BERMAN AND SATER

CHEMICAL ENGINEERING

KE 118 *Chemical Foundations of Engineering.* Atomic and molecular structure, states of matter and their energies, chemical equilibria and reaction rates, organic compounds, and industrial processes. Prerequisite: Superior performance in one year of high school physics and chemistry. Credit, 4 hours.

211, 212 *Chemical Process Calculations.* Principles of physics and chemistry applied to the formulation of material and energy balances for process industries. Prerequisites: CH 114; ME 102. Co-requisite: MA 121. Credit, 2 hours each semester.

331 *Transport Processes.* Development and application of the principles of momentum, energy, and mass transfer. Prerequisite: KE 212. Co-requisite: MA 360. Credit, 4 hours.

332 *Chemical Engineering Operations.* Process operations including distillation, extraction, absorption, drying, crystallization, filtration, materials handling and preparation. Prerequisite: KE 331. Credit, 4 hours.

333 *Transport Phenomena Laboratory.* Physicochemical measurements and determination of transport properties. Prerequisite: KE 331. Three hours laboratory. Credit, 1 hour.

381 *Mathematical Methods for Chemical Engineers.* The mathematical basis of thermodynamics, transport processes and process control. Prerequisite: MA 360 or ES 365. Credit, 3 hours.

422g *Metallurgy.* Extraction of metals, crystal and atomic structure, phase transformations, tests and properties of high temperature metals and refractories, and introduction to spectroscopy. Prerequisite: ME 331 or CH 441. Two lectures, 3 hours laboratory. Credit, 3 hours.

423g *Materials Processing.* Phase transformations, crystallography, growth processes, kinetics of solid state transformations; technology of high and low temperatures, vacuum systems, high pressure, and clean environments. Prerequisite: KE 331 or KE 441. Credit, 3 hours.

441g, 442g *Chemical Process Principles.* Physicochemical principles including thermodynamics and kinetics applied to the process industries. Prerequisite: CH 441. Credit, 3 hours each semester.

445g *Nuclear Materials Processing.* Chemical processing of nuclear materials for the production and recovery of fuel. Separation and recovery of radioactive by-products. Co-requisite: KE 332. Credit, 3 hours.

451, 452 *Chemical Engineering Laboratory.* Operation, control and design of experimental and industrial process equipment. Co-requisite: KE 332. Six hours laboratory. Credit, 2 hours each semester.

461g *Process Control.* Process dynamics, instrumentation, and feedback applied to automatic process control. Prerequisites MA 360 or ES 365; ES 371 or KE 331. Two lectures, 3 hours laboratory. Credit, 3 hours.

462 *Process Design.* Application of economic principles to optimize equipment selection and design; development and design of process systems. Prerequisites: KE 331, KE 441. Credit, 4 hours.

471g *Applied Chemistry.* Industrial applications of chemistry and elements of chemical engineering for non-chemical engineering majors. Credit, 3 hours.

474g *Chemical Technology.* Selected processes and operations in which fundamental physicochemical and mathematical principles are applied. Prerequisites: KE 332, KE 441. Credit, 3 hours.

482g *Statistical Applications in Chemical Engineering.* Interpretation and correlation of data; experimental design; scale-up for design and operation of process plants. Credit, 3 hours.

521 *Extractive Metallurgy.* Principles and unit processes by which metals are extracted from their naturally occurring ores and other raw material sources. Credit, 3 hours.

523 *Materials Processing.* Solid state theory; control of morphology, purity, growth and defects; formation, structure, and properties of thin films; micro-crystals, whiskers, and organic crystals. Prerequisite: KE 422g or KE 423g. Credit, 3 hours.

524 *Surface Phenomena.* Structure and thermodynamics of surfaces, grain boundary mobility and migration; friction, adhesion, and lubrication; electronic surface properties, interaction of surfaces with gases; corrosion; foams. Prerequisite: KE 441. Credit, 3 hours.

533, 534 *Transport Processes.* Momentum transfer including turbulent and viscous flow. Newtonian and non-Newtonian fluids, compressible flow, packed and fluidized beds; energy and mass transfer in static and dynamic systems. Prerequisite: KE 332. Credit, 3 hours each semester.

535 *Unit Operations.* Transport principles applied to selected unit operations such as distillation, absorption, extraction, drying, ion exchange, and crystallization. Co-requisite: KE 534. Credit, 3 hours.

543 *Thermodynamics of Chemical Systems.* Application of classical and statistical thermodynamics to non-ideal physicochemical systems and processes; prediction of optimum operating conditions. Prerequisite: KE 441 or ES 381. Credit, 3 hours.

544 *Chemical Process Kinetics.* Reaction rates, thermodynamics, and transport principles applied to the design and operation of chemical reactors. Prerequisite: KE 543. Credit, 3 hours.

562 *Chemical Systems Engineering.* Process dynamics, systems analysis, computer applications, process control. Credit, 3 hours.

563, 564 *Chemical Engineering Design.* Computational methods; the design of chemical plants and processes. Credit, 3 hours each semester.

571 *Electrochemical Engineering.* Principles of electrochemical reactions applied to selected topics such as chemical production, electroplating, electrodialysis, and fuel cells. Prerequisite: CH 442. Credit, 3 hours.

572 *Chemical Process Industries.* Application of thermodynamics, kinetics, and other process principles to the study of selected industries. Credit, 3 hours.

581 *Chemical Process Analysis.* Mathematical analysis and development of chemical process operations. Credit, 3 hours.

Special Graduate Courses: 498g, 500, 590, 591, 592, 593, 594, 600, 690, 691, 692, 700, 790, 791, 792, 799. (See page 215-216.)

CIVIL ENGINEERING

PROFESSORS Robert D. Kersten (EC G136A), Klock, Pian, Schoeller, Wilson; ASSOCIATE PROFESSORS Betz, Newlin, Ruff; ASSISTANT PROFESSORS Hill, Lundgren, O'Bannon; INSTRUCTORS Borgo, Thornton

CIVIL ENGINEERING

CE 220 *Mechanics.* Principles of mechanics and selected topics of mathematics as the basis for structural analysis. Not open to engineering students. Prerequisite: MA 120. Credit, 3 hours. (Same as AC 261).

241 *Surveying.* Theory and field work in construction and land surveys. Prerequisite: MA 118. Two lectures, 3 hours laboratory. Credit, 3 hours.

311 *Materials of Engineering.* Structural and behavioral characteristics, engineering properties measurement, and applications of engineering materials. Prerequisite: CE 321 or CO 322. One lecture, 3 hours laboratory. Credit, 2 hours.

320 *Mechanics.* Principles of mechanics and selected topics of mathematics as the basis for structural analysis. Not open to engineering students. Prerequisite: CE 220. Credit, 3 hours. (Same as AC 362).

321 *Structural Mechanics.* Rigorous treatment of successive integration, conjugate beam and area moment applied to both simple and restrained beams with constant or variable moments of inertia. Moment distribution, constant and variable I and infinite series. Influence lines, simple and continuous beams. Truss analysis and influence lines for simple trusses using vector notation. Co-requisite: ES 321. Three lectures. Credit, 3 hours. (Same as AC 363).

322 *Theory of Design.* Theory of design applied to reinforced concrete (elastic and ultimate strength), steel and other materials. Beams, columns and eccentrically loaded columns investigated theoretically, analytically, and by use of developed design aids. Prerequisite: CE 321. Three lectures, 3 hours laboratory. Credit, 4 hours. (Same as AC 464).

342 *Surveying.* Precise traverse triangulation, azimuth determination, and leveling; errors and correction; plane coordinate systems. Elements of photogrammetry, topographic mapping, hydrographic, mine, and special surveys. Prerequisite: CE 241. One lecture, 6 hours laboratory. Credit, 3 hours.

343 *Surveying and Geodesy.* Methods of geodetic surveying. Adjustment of observations. Geodetic positions. Map projections. Prerequisite: CE 342. One lecture, 6 hours laboratory. Credit, 3 hours.

344 *Route Surveying.* Simple, compound and transition curves, reconnaissance, preliminary, and location survey. Calculation of earthwork. Prerequisite: CE 241. Two lectures, 3 hours laboratory. Credit, 3 hours.

380 *Construction Hyrdaulics and Hydrology.* Applied hydraulics and hydrology for river, marine, and utility construction. Elements of climatology, drainage, flood control, and dynamics of water bodies. Irrigation, navigation, water and sewage treatment systems. Pipelines, pumps, conduits, channels, and hydraulic structures. Not open to engineering students. Prerequisite: Approval of instructor. Credit, 3 hours.

381 *Hydraulic Engineering.* Analysis of flow in pressure conduits and open channels. Applications in irrigation, drainage, hydroelectric power, river navigation, flood control, and multiple-purpose projects. Prerequisite: ES 371. Credit, 3 hours.

382 *Hydrology.* Elementary meteorology, climatology, hydrologic cycle, precipitation, evaporation and transpiration, hydrograph analysis; subsurface water; frequency analysis; water law. Co-requisite: ES 371. Credit, 2 hours.

385 *Fluid Mechanics Laboratory.* Investigations and analysis of basic flow phenomena, engineering applications; laboratory technique. Prerequisite: ES 371. Three hours laboratory. Credit, 1 hour.

423 *Structural Design.* Plastic design in steel. Pre-stressed concrete. Footings and retaining walls. Industrial type buildings. Prerequisite: CE 322. Two lectures, 3 hours laboratory. Credit, 3 hours.

424 *Architectural Structures.* Design and analysis of masonry buildings and high-rise buildings. Elastic methods utilized for gravity loads. Lateral forces considered by statical and modified statical methods. Prerequisite: CE 423. Two lectures, 3 hours laboratory. Credit, 3 hours.

431g *Theory of Structures.* Methods rigorously treated include: elastic curvature, real work, virtual work, Castigliano's 1st and 2nd theorems, consistent deformation, three moment equation, slope deflection, moment distribution, elastic centers, and influence lines. Prerequisite: CE 321. Credit, 3 hours.

432g *Theory of Structures.* Application of numerical methods in structural analysis and design, including finite difference methods. Selection of methods especially appropriate for digital computers. Co-requisite: CE 431g. Credit, 3 hours.

441g *Photogrammetry.* Mapping and surveying using aerial photographs and stereoscopic plotters. Prerequisite: CE 342. One lecture, 6 hours laboratory. Credit, 3 hours.

450 *Soil Mechanics in Construction.* Soil mechanics as applied to the construction field. The fundamental properties of soils with application to foundations, highways, retaining walls and slope stability. The relationship between soil characteristics and geologic formations. Prerequisite: Senior standing, or approval of instructor. Not open to engineering students. Two lectures, 3 hours laboratory. Credit, 3 hours.

451 *Soil Mechanics.* Index properties and engineering characteristics of soils. Compaction, shear, compressibility, and permeability. Prerequisites: CE 311 and CE 321. Two lectures, 3 hours laboratory. Credit, 3 hours.

452g *Soil Mechanics.* Applications of soil mechanics to retaining walls, slope stability, highways, earth dams, and foundations. Prerequisite: CE 451. Two lectures, 3 hours laboratory. Credit, 3 hours.

453g *Site Foundation Engineering.* Geological investigations for engineering purposes, case histories, interpretation of geologic maps and aerial photographs, major aspects of geologic structure, rock mechanics, weathering, river mechanics, glacial deposits, eolian deposits in the site location for an engineering structure. Prerequisite: GL 311 or approval of instructor. Credit, 3 hours.

461 *Sanitary Engineering.* Chemistry of natural waters, water quality requirements, elements of hydrology and the principles of treatment processes, impoundment and distribution systems. Co-requisite: CE 381. Credit, 3 hours.

462 *Sanitary Engineering.* Biochemistry of wastes, principles of waste treatment processes, elements of domestic and storm sewer systems. Corequisite: CE 381. Credit, 3 hours.

463g *Sanitary Chemistry Laboratory.* Chemical and biological analysis of water, sewage, and industrial wastes; laboratory procedures for the control of water and sewage treatment processes. Prerequisite: CE 461. Two lectures, 3 hours laboratory. Credit, 3 hours.

464g, 465g *Industrial Hygiene.* Selected topics in industrial hygiene including survey methods, legal and physiological aspects of occupational health hazards. Introduction to methods of measurement and analysis and physiological actions of such contaminants as toxic gases, mineral dusts, metals and their compounds, and industrial solvents. Prerequisite: Approval of instructor. Two lectures, 3 hours laboratory. Credit, 3 hours.

471g *City Planning.* Municipal organization and administration; public health, public utilities, services, zoning, replanning, critical studies. Prerequisite: Approval of instructor. Credit, 3 hours.

472 *Transportation Engineering.* Elementary investigation of all forms of transport—highway, rail, water, air. Will point up similarities and differences in construction, operation, planning and administration. Prerequisite: Senior standing. Three lectures. Credit, 3 hours.

473g *Municipal Engineering.* Engineering and legal problems of the city engineer, city government, city surveys, subdivision design, building codes, legal procedures for making public improvements. Prerequisite: Approval of instructor. Credit, 3 hours.

474g *Traffic Engineering.* Study of operator and vehicle characteristics, street capacity, signals, signs and markings, etc. All phases of traffic engineering as applied to urban areas. Prerequisite: Approval of instructor. Credit, 3 hours.

475g *Highway Geometric Design.* The design of the visible elements of the roadway. Study of fundamental design controls and elements with application to rural roads, at-grade intersections, freeways, and interchanges. Prerequisites: CE 344, CE 472. Two lectures and 3 hours laboratory. Credit, 3 hours.

481g *Hydraulic Structures.* Principles of design of dams, spillways, gates, control structures, energy dissipators, channels and transitions, conduits, economic aspects. Prerequisite: CE 381. Credit, 3 hours.

482g *Hydraulics of Open Channels.* Principles; theory of uniform, gradually varied, rapidly varied, and unsteady flow. Prerequisite: CE 381. Credit, 3 hours.

491g *Numerical Analysis in Engineering.* Application of numerical procedures to the solution of complex engineering problems. Analysis and organization of practical programs for numerical solution of initial, boundary, and eigenvalue problems. Prerequisite: MA 360 or ES 365. Credit, 3 hours.

492 *Topics in Civil Engineering.* Selection and evaluation of the significant variables in civil engineering problems. Application of concepts acquired in undergraduate curriculum to the development of a rational and feasible problem solution. Prerequisite: Senior standing. Credit, 1 hour.

525 *Bridge Design.* Design of simple and continuous bridges utilizing steel, concrete, prestressed concrete, and composite structural members. Prerequisites: CE 423, CE 431g. Credit, 3 hours.

526 *Building Design.* Structural design (elastic and plastic) of buildings and frames. Methods of framing, wind and earthquake forces; special systems. Prerequisite: CE 423 or CE 424. Co-requisite: CE 431g. Credit, 3 hours.

527 *Concrete Structures.* Elastic, ultimate strength and yield line theory. Deflection, torsion, shrinkage and plastic flow. Prestressed concrete; special systems. Prerequisite: Approval of instructor. Credit, 3 hours.

528 *Stability of Structures.* Elastic and inelastic buckling of rolled and sheet metal beam columns. Local buckling of flanges and webs of beams and columns. Stability of continuous frames. Prerequisite: Approval of instructor. Credit, 3 hours.

529 *Hydraulic and Sanitary Structures.* A course in structures designed primarily for graduate students majoring in hydraulics or sanitary engineering. Prerequisite: Approval of instructor. Three lectures. Credit, 3 hours.

533 *Theory of Structures.* Analysis of complex systems using both classical and modern methods. Prerequisites: CE 431g, CE 432g. Credit, 3 hours.

534 *Theory of Structures.* Analysis of space structures. Prerequisites: CE 431g, CE 432g. Credit, 3 hours.

535 *Plate and Shell Structures.* Membrane stresses in tank and roof shells; applications of plate theory; discontinuity stresses in domes and tanks; barrel shell roofs. Prerequisite: ES 522 or approval of instructor. Three lectures. Credit, 3 hours.

536 *Structural Dynamics.* Vibration theory as applied to the analysis of structures and structural members subjected to dynamic loadings; response spectra theory with emphasis on earthquake applications; investigations of the response of single and multi-degree of freedom structures; matrix methods of analysis. Prerequisite: Approval of instructor. Credit, 3 hours.

553 *Theoretical Soil Mechanics.* Fundamental structure and properties in soils. Formation of soils, clay mineralogy, and soil structure. Theory of consolidation, compaction. Prerequisite: CE 451. Two lectures, 3 hours laboratory. Credit, 3 hours.

554 *Theoretical Soil Mechanics.* Shear strength of soils and shear test techniques. Earth pressure theories, and stability of slopes. Prerequisite: CE 451. Two lectures, 3 hours laboratory. Credit, 3 hours.

555 *Applied Soil Mechanics.* Application of theoretical soil mechanics to engineering problems. Loads on retaining walls, anchored bulkheads, footings, pile foundations, Site investigation and sampling techniques. Prerequisite: Approval of instructor. Two lectures, 3 hours laboratory. Credit, 3 hours.

556 *Seepage and Earth Dams.* Flow of water through soils. Pore water pressure. Emphasis on flow nets and the design of earth dams. Prerequisite: CE 451. Two lectures, 3 hours laboratory. Credit, 3 hours.

561 *Theory and Design of Water Treatment Facilities.* Theory and design of processes used in the supply and treatment of water. Prerequisite: CE 461 or equivalent. Credit, 3 hours.

562 *Theory and Design of Waste Treatment Facilities.* Theory and design of waste treatment and disposal systems. Prerequisite: CE 462 or equivalent. Credit, 3 hours.

563 *Sanitary Engineering Processes Laboratory.* Laboratory study of unit processes involved in water and waste treatment. One lecture, 3 hours laboratory. Prerequisite: Approval of instructor. Credit, 2 hours.

567 *Atmospheric Pollution.* Selected topics including atmospheric composition and dynamics, origins and chemistry of contamination, biological significance, analytical measurement, engineering control methods and air pollution legislation. Prerequisite: Approval of instructor. Credit, 1-3 hours.

568 *Epidemiology and Public Health Engineering.* Selected topics including biology and transmission of diseases, mathematical theory of epidemics, sanitation and public health administration. Prerequisite: Approval of instructor. Credit, 1-3 hours.

571 *Transportation Engineering.* Regional transportation facilities stressing non-highway modes. Items included will be design, operation, planning, administration and economics. Prerequisite: CE 472. Credit, 3 hours.

572 *Design of Highway and Airport Pavements.* Design practices, materials, and testing of flexible and rigid pavements. Prerequisites: CE 451, CE 472. Two lectures, 3 hours laboratory. Credit, 3 hours.

573 *Urban Transportation Planning.* Application of traffic engineering and city planning techniques to the solution of the urban transportation problem. Included will be forecasting methods, traffic generation and simulation theory, role of transit, parking studies, etc. Prerequisite: Approval of instructor. Credit, 3 hours.

574 *Highway Engineering, Planning and Economics.* Highway transportation including design, construction, operation, planning, economic feasibility and financing. Stress will be applied to highways as a regional system. Prerequisite: Approval of instructor. Credit, 3 hours.

581 *Hydrology. Advanced Hydrologic Principles.* Hydrologic measurements, statistical analysis of data; design storms, flood routing; ground water theory. Prerequisite: CE 381. Credit, 3 hours.

583 *Flood Management.* Floods and their causes, flood forecasting, social, economic and administrative aspects, design of flood control works. Prerequisite: CE 381. Credit, 3 hours.

584 *Theoretical and Applied Hydraulics.* History of hydraulics, hydraulic similitude, pressure conduits, waves and surges, mechanics of sediment transport. Special topics. Prerequisite: CE 381. Credit, 3 hours.

585 *Hydraulic Laboratory.* Experimental investigations of hydraulic model laws, open channel models, hydraulic structures, sediment transport, energy dissipation. Prerequisite: Approval of instructor. Credit, 1-3 hours.

587 *Hydraulic Design.* Analytical and experimental investigation of

problems of typical hydraulic design. Prerequisite: Approval of instructor. Credit, 1-3 hours.

588 *Water Resources Development.* Engineering, administrative and economic problems of a regional water resources development program. Evaluation of a river basin in the area. Prerequisite: Approval of instructor. Credit, 3 hours.

Special Graduate Courses: 500, 590, 591, 592, 593, 594, 600, 690, 691, 692, 700, 790, 791, 792, 799. (See page 215-216.)

ELECTRICAL ENGINEERING

PROFESSORS T. B. THOMPSON (G 120B), ADAMS, BARKSON, HAPP, KAUFMAN, STAUDHAMMER; ASSOCIATE PROFESSORS AX, DONNELLY, GUPTA, JORDAN, KELLY, STEINMANN, ZIMMER; ASSISTANT PROFESSORS HASDORFF, PALAIS, SPRAGINS; INSTRUCTORS ANDERSON, ROBBINS, WALKER

ELECTRICAL ENGINEERING

EE 226 *Digital Computer Programming.* Programming and operation of IBM 1620 Computer. Prerequisite: For engineers, ME 102; other students, MA 117 and sophomore standing. One lecture, 2 hours laboratory. Credit, 2 hours.

301 *Electrical Networks.* Mathematical analysis of networks and linear systems. Prerequisite: ES 231; co-requisite: MA 360. Three lectures, 3 hours laboratory. Credit, 4 hours.

302 *Electrical Networks.* Continuation of EE 301. Prerequisite: EE 301. Three lectures. Credit, 3 hours.

326 *Computer Techniques.* Computers and solution of engineering problems by computer techniques. Prerequisite: ME 102; co-requisite MA 360 or ES 365. Two lectures, 2 hours laboratory. Credit, 3 hours.

331 *Electronic Engineering.* Electronic Circuits. Prerequisite: EE 301. Two lectures, 3 hours laboratory. Credit, 3 hours.

332 *Electronic Engineering.* Continuation of EE 331. Prerequisite: EE 331. Four lectutres, 3 hours laboratory. Credit, 5 hours.

341 *Electromagnetic Fields.* Introductory field theory. Prerequisite: ES 231, MA 362 or 460. Credit, 3 hours.

362 *Electromechanics.* Energy conversion by electromechanical methods. Prerequisite: EE 301. Credit, 3 hours.

401g *Electrical Networks.* Traveling electromagnetic waves with application to distributed parameters. Prerequisite: EE 302. Two lectures, 3 hours laboratory. Credit, 3 hours.

402g *Electrical Networks.* Topics in the analysis of networks. Prerequisite: EE 401. Credit, 3 hours.

403g *Theory of Systems.* Delta functions, convolution, Laplace and Z-Transform theory, application to continuous and discrete systems, stability. Prerequisite: EE 301. Credit, 3 hours.

420g *Digital Systems.* Application of Boolean algebra to the logical design of switching networks including counters, registers, adders, subtractors, sequential control units, and a simple processor. Principles of stored program computers. Prerequisite: EE 226 or EE 326. Credit, 3 hours.

421g *Digital Systems, Hardware.* Description, theory of operation, and systems aspects of memories, processing units, control units and input/output equipment. Prerequisites: EE 331 and EE 420. Credit, 3 hours.

422g *Digital Systems, Circuits.* Components and electrical circuits for digital systems. Prerequisites: EE 331 and EE 420. Credit, 3 hours.

424g *Digital Systems, Programming.* Description, theory, and parametric analysis of number systems, addressing, data manipulation, recursive operations, program control and input/output control. Prerequisite: EE 420. Credit, 3 hours.

425g *Analog Computers.* Electrical analogs of physical systems. Prerequisite: EE 301. Two lectures, 3 hours laboratory. Credit, 3 hours.

426g *Computing Methods.* Numerical solution of problems on modern electronic digital computers. Topics include floating point round-off error, rational function approximation, numerical solution of equations. Prerequisites: EE 226 or EE 326 and MA 362 or ES 366. Credit, 3 hours.

429g *Symbolic Programming.* Machine language and assemblers. Prerequisite: EE 226 or EE 326. Credit, 3 hours.

430g *Semiconductor Devices.* Physical theory and models for the junction diode and transistor. Electrical characterization in terms of lumped parameter and charge control models. Prerequisites: EE 341, ES 350. Credit, 3 hours.

431g *Majority Carrier Devices.* Theremo-electric, photovoltaic, luminescent, thermoionic and cryogenic phenomena and devices. Prerequisite: ES 350. Credit, 3 hours.

432g *Solid State Devices.* Theory and application of semiconductor devices. Two hours lecture, 3 hours laboratory. Prerequisite: EE 430. Credit, 3 hours.

433g *Applied Electronics.* Theory, design, evaluation and application of electronic circuits and systems. Prerequisite: EE 331. Credit, 3 hours.

434g *Transistor Circuits.* Continuation of EE 433. Prerequisite: EE 433. Credit, 3 hours.

435g *Communication Theory.* Information transmission, modulation, and noise. Prerequisites: EE 302, EE 332. Three lectures, 3 hours laboratory. Credit, 4 hours.

438g *Communication Systems.* Theory and design of communication systems. Prerequisite: EE 435. Credit, 3 hours.

443g *Antennas.* Theory of radiating systems. Prerequisites: EE 341, EE 401. Credit, 3 hours.

445g *Microwaves.* Microwave devices and systems. Prerequisite: EE 341, 401. Three lectures, 3 hours laboratory. Credit, 4 hours.

451g *Economics of Public Utilities.* Economic, legislative and administrative problems in the regulation of public utility rates and service standards. Study of public utility costs, pricing policies, rates, plant utilization, and competition. Prerequisite: EE 362. Credit, 3 hours.

452g *Matrix Applications.* Solution of linear, polynomial, and systems of differential equations. Application of matrix algebra and matrix calculus to electrical networks and waves. Prerequisites: MA 360 or ES 365, EE 301. Credit, 3 hours.

461g *Electrical Machinery.* Methods and techniques of systems analysis applied to the dynamics of electrical machinery. Prerequisite: EE 362. Two lectures, 3 hours laboratory. Credit, 3 hours.

462g *Motor Applications and Control.* Application of d-c and a-c motors and associated control circuits. Prerequisite: EE 461. One lecture, 3 hours laboratory. Credit, 2 hours.

471g, 472g *Electric Power Systems.* Elements of power-system analysis. Prerequisite: EE 461. Credit, 3 hours each semester.

480g *Control.* Frequency response, root locus, Nyquist criterion, compensation, describing function. Prerequisite: EE 302. Three lectures, 3 hours laboratory. Credit, 4 hours.

481g *Random Processes.* Random variables, averaging, sampling, elements of probability theory. Prerequisite: MA 212. Credit, 3 hours.

490g *Electroacoustics.* Acoustical theory. Prerequisite: MA 362 or ES 366. Credit, 2 hours.

491g *Electromechanical Devices.* Acoustical, piezo-electric hydraulic, pneumatic and diffusion-activated components and systems. Models and equivalent circuits of devices based on physical phenomena. Device analysis by topological techniques. Evaluation of response by approximation techniques and numerical routines. Prerequisite: EE 362. Credit, 2 hours.

495g *Magnetics.* Theory and design of magnetic devices and circuits. Prerequisite: EE 362. Credit, 2 hours.

496g *Professional Seminar.* Professional and other topics of interest to graduating electrical engineers. Open to seniors only. One lecture. Credit, 1 hour.

501 *Passive Networks.* Analysis and synthesis of linear networks. Prerequisites: EE 402, MA 461, or ES 465. Credit, 3 hours.

502 *Passive Networks.* Analysis and synthesis of linear networks, including approximation techniques. Prerequisite: EE 501. Credit, 3 hours.

503 *Active Networks.* Analysis and synthesis of quasi-linear networks containing general active elements. Prerequisite: EE 402. Credit, 3 hours.

520 *Design of Digital Systems, Logic.* Advanced topics in sequential circuit theory and application of matrices to logical design. Prerequisite: EE 421. Credit, 3 hours.

521 *Design of Digital Systems, Hardware.* Methods and techniques of translating systems requirements into optimum hardware designs for a wide range of applications. Prerequisite: EE 421. Credit, 3 hours.

522 *Digital Circuit Design.* Advanced topics in digital circuit design including tunnel diodes, multi-aperture cores, thin films, and integrated circuits. Prerequisite: EE 422. Credit, 3 hours.

523 *Control Computers.* Process control by means of computers. Prerequisites: EE 421, EE 480. Credit, 3 hours.

524 *Design of Digital Systems, Software.* Systems requirements and systems design of the software component of digital systems including assemblers, interpreters, compilers, monitors, maintenance systems. Prerequisite: EE 424. Credit, 3 hours.

525 *Analog Computer Design.* Design of circuitry of electronic analog computers. Prerequisites: EE 332 and EE 425. Credit, 3 hours.

526 *Design of Automatic Programming Systems.* Methods and techniques of designing compilers for languages such as Fortran and ALGOL. Prerequisites: EE 424 and EE 429. Credit, 3 hours.

529 *Programming Techniques.* Programming analysis and synthesis. Prerequisite: EE 429. Credit, 3 hours.

531 *Solid State Electronics.* Theory of solid-state devices. Prerequisite: EE 430. Credit, 3 hours.

532 *Solid State Electronics.* Theory of solid-state devices. Prerequisite: EE 531. Credit, 3 hours.

533 *Integrated Circuit Design.* Projects: Designs of complete circuits from customers specification through layout, masking, thin-film deposition and testing. Prerequisite: EE 434. Credit, 3 hours.

534 *Device Design.* Diffusion profiles, surface passivation, isolation and parasitics. Amplification mechanisms. Criteria for speed and power. CdS-TFT structures. Modelling and scaling. Prediction of circuit parameters. Cost and reliability. Prerequiiste: EE 431. Two lectures, 3 hours laboratory. Credit, 3 hours.

535 *Modulation Theory.* Principles and applications of various types of modulation including amplitude, frequency, phase, pulse amplitude, pulse width and pulse position modulation. Prerequisite: EE 435 or consent of instructor. Credit, 3 hours.

541 *Electromagnetic Fields.* Electromagnetic fields, forces, matter, and energy. Prerequisite: EE 341. Credit, 3 hours.

542 *Electromagnetic Waves.* Radiation, propagation, reflection, refraction, and guided waves. Prerequisite: EE 541. Credit, 3 hours.

543 *Antennas.* Analysis and synthesis of various radiating structures and systems. Prerequisites: EE 542 or both EE 443 and EE 541. Credit, 3 hours.

544 *Electromagnetic Theory.* Selected topics from current literature. Prerequisite: EE 542. Credit, 3 hours.

545 *Microwave Tubes.* Ion dynamics, space charge, and analysis of magnetrons, klystrons, and traveling wave tubes. Prerequisites: EE 542 or both EE 445 and EE 541. Credit, 3 hours.

546 *Propagation in Anisotropic Media.* Wave propagation in dielectric, magnetic, and gaseous media. Prerequisite: EE 542. Credit, 3 hours.

547 *Microwaves.* Advanced microwave theory. Prerequisites: EE 542 or both EE 445 and EE 541. Credit, 3 hours.

550 *Applied Operational Mathematics.* Transform techniques; special functions. Applications of Laplace, Fourier, Cauchy-Taylor, Hankel, Mellin and other transforms to engineering problems. Prerequisites: EE 403, MA 461 or ES 465. Credit, 3 hours.

552 *Error Correcting Codes.* Application of the techniques of modern algebra to the analysis of error-correcting and error-detecting codes. Prerequisite: EE 420 or consent of instructor. Credit, 3 hours.

555 *Noise Theory.* Application of correlation functions, power spectral densities and related techniques to analysis and filtering of signals corrupted by noise. Prerequisite: EE 481 or IE 471. Credit, 3 hours.

556 *Applied Decision Theory.* Statistical decision theory with applications to optimum detection and estimation of signals, pattern recognition

and related problems; applications of machine learning techniques. Prerequisite: EE 481 or IE 471. Credit, 3 hours.

557 *Information Theory.* Definitions of information sources and channels; fundamental theorems of information theory and their significance; simple error-detecting and error-correcting codes. Prerequisite: EE 481 or IE 471. Credit, 3 hours.

560, 561 *Concepts in Electrical Engineering.* A comprehensive review of the principles and techniques of electrical engineering with emphasis on recent developments. Credit not applicable to graduate degree. Credit, 3 hours each.

570 *Symmetrical Components.* Theory and application of symmetrical components to the analysis of power systems and machines. Prerequisites: EE 401, EE 461. Credit, 3 hours.

571 *Power System Stability.* Transient and steady-state stability limits of power systems. Prerequisites: EE 461, EE 471. Credit, 3 hours.

572 *High-Voltage Engineering.* High-voltage sources, breakdown, measurements, and transmission. Prerequisite: EE 471. Credit, 3 hours.

574 *Unconventional Power Sources.* Energy conversion devices and systems other than conventional rotating machines. Prerequisite: EE 461. Credit, 3 hours.

575 *Analysis of Power Networks.* Tensor and matrix methods applied to problems involving extensive complex circuits. Prerequisite: EE 471. Credit, 3 hours.

580 *Linear Control.* Compensation, sampled data, integral square error. Prerequisite: EE 480; Co-requisite: MA 461 or ES 465 or EE 403. Credit 3 hours.

581 *Random Process Control.* Correlation functions, Wiener filtering theory, Kalman filtering. Prerequisite: EE 481 or IE 471. Co-requisite: MA 461 or ES 465, or EE 403. Credit, 3 hours.

583 *State Space Techniques.* Application of matrices to networks and feedback systems, eigenvalue, eigenvector applications, stability, time varying systems. Prerequisite: EE 403 or approval of instructor. Credit, 3 hours.

584 *Analysis of Control Components.* Transfer functions of hydraulic, pneumatic, mechanical, and electrical devices. Prerequisite: EE 480. Two lectures, 3 hours laboratory. Credit, 3 hours.

586 *Nonlinear Control.* Nonlinear differential equations, phase space, Lyapunov's method, relay switching. Prerequisite: EE 480, Co-requisite: MA 342 or MA 442 or EE 583.

587 *Optimal Control.* Application of state variables, dynamic programming and calculus of variations to control problems, maximum principle. Prerequisite: EE 580 or EE 586. Co-requisite: EE 583. Credit, 3 hours.

588 *Automata.* Theory of finite state machines, deterministic and probabilistic. Credit, 3 hours.

589 *Artificial Intelligence.* Intelligence by artificial means. Credit, 3 hours.

Special Graduate Courses: 500, 590, 591, 592, 593, 594, 600, 690, 691, 692, 700, 790, 791, 792, 799. (See page 215-216.)

ENGINEERING SCIENCE

PROFESSORS WALLACE (EC G120C), KERSTEN, MYKLESTAD, RICE, TURNBOW; ASSOCIATE PROFESSORS ALLEN, AVERY, DITSWORTH, GYOROG, LOGAN, MEIROVITCH, METZGER, WATSON, WILCOX, WOOLRIDGE ;ASSISTANT PROFESSORS ADAMS, JANKOWSKI, STADMILLER; INSTRUCTOR NELSON

ENGINEERING SCIENCE

ES 211 *Engineering Mechanics.* Force systems, resultants, equilibrium, kinematics and kinetics of particles, distributed forces, first and second moments of areas, trusses, beams and cables. Co-requisite: MA 212. Credit, 3 hours.

231 *Electrical Science.* Basic concepts and inter-relations of electricity and magnetism. Prerequisites: MA 212, ES 211. Credit, 3 hours.

312 *Engineering Mechanics.* Kinematics of rigid bodies, moving coordinate systems, kinetics of systems of particles, rigid body dynamics. Prerequisite: ES 211; co-requisite: MA 360 or ES 365. Credit, 3 hours.

321 *Mechanics of Materials.* Concepts of stress and strain, Hooke's law; strength and deflection of axial force members, shafts in torsion and beams in flexure; combined stress; stability of columns. Prerequisite: ES 211; co-requisite: MA 360 or ES 365. Credit, 3 hours.

322 *Mechanics of Materials.* Unsymmetrical bending of beams, shear flow theory, shear center. Energy methods with applications to rings. Columns with initial curvature, beam columns and beam struts. Prerequisite: ES 321. Credit, 2 hours.

350 *Theory of Material Properties.* Symmetry properties and macroscopic properties of ideal crystals. Atomic-electronic origin of physical properties. Effects of imperfections on physical properties. Prerequisites: ES 321, ES 381. Credit, 3 hours.

365 *Methods in Engineering Analysis.* Exact and numerical solutions of ordinary and partial differential equations and vector analysis with applications to the problems that frequently appear in engineering. Prerequisite: MA 212. Credit, 3 hours.

366 *Methods in Engineering Analysis.* Topics from advanced calculus: functions of several variables, power series, Fourier series and integrals and their application to problems in engineering. Prerequisite: ES 365. Credit, 3 hours.

371 *Fluid Mechanics.* Formulation of the principles of fluid mechanics from those of dynamics and thermodynamics. Topics in gas dynamics, potential flow, empirical hydraulics, and boundary layer concepts. Prerequisites: ES 312, ES 381. Credit, 3 hours.

372 *Fluid Mechanics.* Continuation of gas dynamics including shock waves, viscous flow analysis and solutions in boundary layer theory, laminar and turbulent flow concepts, similarity considerations. Prerequisite: ES 371. Credit, 3 hours.

381 *Thermodynamics.* Work, heat and energy transformations. Relation of properties. Laws, concepts and modes of analysis common to all applications of thermodynamics in engineering. Prerequisite: MA 212. Credit, 3 hours.

400 *Technical Communications.* Composition for technical papers, re-

ports and scientific articles suitable for publication. Oral and written presentation. Credit, 3 hours.

413g *Dynamics of Rigid Bodies.* Three dimensional kinematics, including moving coordinate systems, systems of particles, Euler's moment equations, gyroscopic motion, and Lagrange's equations of motion. Prerequisites: ES 312, MA 360 or ES 365. Credit, 3 hours.

421g *Vibration Analysis.* Undamped and damped vibrations of single-degree-of-freedom systems. Forced vibration: periodic excitation, transient response. Many degrees of freedom systems, normal modes, vibration of elastic bodies. Prerequisites: ES 312, MA 360 or ES 365. Credit, 3 hours.

422g *Mechanics of Materials.* Generalized Hooke's Law. Energy theorems and variational methods with applications to bending of rings, beams on elastic foundation and torsion of prismatic bars. Introduction to limit analysis, upper and lower bound theorems with applications. Credit, 3 hours.

423g *Transients in Linear Systems.* Formulation and solutions of equations of behavior of both lumped and continuous linear systems. Solutions by means of Laplace transformation and other methods. Applications from the fields of: engineering mechanics, mechanical and electrical engineering. Prerequisite: MA 362 or ES 366. Credit, 3 hours.

450g *Mechanical Properties of Engineering Materials.* Mechanical behavior of engineering materials from the microscopic point of view and the influence of structural defects in determining material properties. Selected topics include plastic deformation, fracture, creep, fatigue, internal friction and radiation damage. Prerequisite: ES 350. Credit, 2 hours.

465g *Analytical Methods in Engineering.* Complex variables with application to problems in engineering: analytic functions, integrals, power series, conformal mapping, application of conformal mapping to problems in fluid flow heat transfer, and electric potential. Credit, 3 hours.

466g *Analytical Methods in Engineering.* Solutions of partial differential equations with application to the boundary value problems of engineering: separation of variables, method of characteristics, transform techniques, numerical methods, problems in gas dynamics, heat transfer, vibrations, and electric circuits. Credit, 3 hours.

474g *Fluid Mechanics.* A unified treatment of fluid mechanics with particular emphasis on more advanced topics such as turbulence, stability, exact and approximate solutions to the equations of viscous flow. Prerequisite: ES 372. Credit, 3 hours.

481g *Statistical Thermodynamics.* Statistical approach to thermodynamic concepts, laws, and methods of analysis. Generalized p-v-T data. Special systems. Prerequisite: ES 381. Credit, 3 hours.

483g *Heat Transfer.* Steady and unsteady heat conduction in one and two dimensions. Application of boundary layer analysis and thermodynamics to forced and free convection of heat. Introduction to radiation concepts. Prerequisite: ES 372. Credit, 3 hours.

491 *Engineering Science Laboratory.* Selected experiments with systems of mechanical, electrical, thermal, fluid, and chemical nature. Prerequisites: ES 321, ES 371, and EE 301. One hour lecture, two hours recitation, three hours laboratory. Credit, 3 hours.

492, 493 *Projects in Design and Development.* Individual and small-group projects employing design, analysis, and development techniques. Credit, 3 hours each semester.

513 *Dynamics of Rigid Bodies.* Kinematics of space motion. Particle dynamics; momentum and energy theorems; motion under a central force. Systems of particles; Hamilton's principle and Lagrange's equation. Rigid body dynamics; Euler's moment equations; gyroscopic motion. Prerequisite: ES 312. Credit, 3 hours.

515 *Methods of Vibrations.* Lumped and distributed mass systems. Advanced principles of dynamics. Normal mode vibration. Energy methods. Exact solutions of differential equations of motion. Approximate methods. Response to periodic and nonperiodic excitation. Prerequisite: ES 421. Credit, 3 hours.

516 *Methods of Vibrations.* Damped multi-degree of freedom systems. Vibrations of strings, beams, membranes, and plates by classical and transform methods; random vibrations. Prerequisite: ES 515. Credit, 3 hours.

517 *Nonlinear Oscillations.* Free and forced oscillations with nonlinear restoring forces. Self-sustained oscillations, stability of nonlinear oscillations; limit cycles, relaxation oscillations. Credit, 3 hours.

522 *Theory of Plates and Shells.* Pure bending of thin plates, laterally loaded plates, symmetrically loaded circular plates, rectangular plates. Membrane theory of shells including shells of revolution, and cylindrical shells. Credit, 3 hours.

523 *Theory of Plates and Shells.* Special and approximate methods in theory of plates. Plates on elastic foundation, large deflection of plates, buckling of plates. Differential geometry of shells, bending theory of shells of revolution, asymptotic integration. Prerequisite: ES 522. Credit, 3 hours.

524 *Theory of Elasticity.* Analysis of stress and strain in three dimensions. Generalized Hooke's law. Extension, torsion, and flexure of bars. Two-dimensional elastostatic problems. Work and energy theorems. Thermal stress. Credit, 3 hours.

525 *Theory of Elasticity.* Three-dimensional problems. Visco-elasticity. Wave propagation. Prerequisite: ES 524. Credit, 3 hours.

527 *Plasticity.* Mechanics of materials beyond the range of Hooke's Law. Limit analysis. Theory of flow and fracture of solids. Credit, 3 hours.

529 *Theory of Elastic Stability.* Stability analysis of bars under separate or combined axial, lateral, and torsional loading. Buckling of plates. Selected topics. Credit, 3 hours.

550 *Dislocation Theory.* Theory and properties of dislocations in crystalline solids. Experimental techniques used to study imperfections. Prerequisites: ES 450g, ES 524. Credit, 3 hours.

572 *Mechanics of Inviscid Incompressible Flow.* Fluid motions which can be described by scalar and vector potentials: air foil theory, free streamline problems, vortex motions, surface waves. Credit, 3 hours.

573 *Mechanics of Inviscid Compressible Flow.* Shock waves and the analysis of subsonic, supersonic, and hypersonic flow fields; method of characteristics and of small perturbations; slender body theory. Credit, 3 hours.

574 *Mechanics of Viscous Flow.* Development of the equations for viscous fluid motion; compressible and incompressible boundary layer analysis for laminar and turbulent flow. Credit, 3 hours.

575 *Mechanics of Viscous Flow.* Continuation of compressible and incompressible boundary layer analysis for laminar and turbulent flow;

thermal boundary layers; statistical theories of turbulence; theories of stability. Prerequisite: ES 574. Credit, 3 hours.

576 *Magnetofluidmechanics.* Development of the fundamental equations from the laws of fluid, electric, and magnetic fields; magnetohydrodynamic waves; and study of one-and two-dimensional field problems. Credit, 3 hours.

577 *Transport Phenomena.* Transport of momentum, mass and energy in laminar and turbulent flow. Field methods and macroscopic balances as means of application of theory in solving steady and unsteady problems in one, two and three dimensions. Credit, 3 hours.

581, 582 *Thermodynamics.* Laws of equilibrium thermodynamics; relations between properties and aspects of the Second Law; Maxwell relations; general stability criteria. Thermodynamics of special systems; p-v-T relations; property calculations; introduction to chemical thermodynamics. Prerequisite: ES 381 or equivalent. Credit, 3 hours each semester.

583 *Statistical Mechanics.* Classical and quantum statistics; macroscopic thermodynamic and transport properties; application. Credit, 3 hours.

584 *Thermodynamics of Irreversible Processes.* Entropy production of non-equilibrium systems; Onsager theorem; linearized solutions; current developments. Credit, 3 hours.

585 *Conduction Heat Transfer.* Conduction of heat in one, two, and three dimensional bodies, steady and unsteady; classical mathematical methods and current numerical methods. Credit, 3 hours.

586 *Convection Heat Transfer.* Thermal boundary layer analysis applied to steady and unsteady two and three dimensional heat convection problems; transpiration and film cooling, mass transfer. Credit, 3 hours.

587 *Radiation Heat Transfer.* Thermal radiation and radiative properties, including electromagnetic wave propagation, Lorentz atom theory, Einstein coefficients and spectral emissivities of gases. Credit, 3 hours.

Special Graduate Courses: 500, 590, 591, 592, 593, 594, 600, 690, 691, 692, 700, 790, 791, 792, 799. (See page 215-216.)

INDUSTRIAL ENGINEERING

PROFESSORS C. B. GAMBRELL (EC G136C), DECKER, MOAN, NUTT;
ASSOCIATE PROFESSORS BEDWORTH, HOYT, PRITSKER

INDUSTRIAL ENGINEERING

IE 100 *Biomechanics.* Mechanical analysis as applied to ordinary living events. Laboratory assignments. Credit, 3 hours.

101 *Biomechanics.* Analysis and explanation of ordinary physiological events. Credit, 3 hours.

200 *Industrial Engineering.* Concepts, scope and methods of industrial engineering. Credit, 2 hours.

311 *Engineering Economy.* Economic evaluation of engineering alternatives. Prerequisite: MA 120. Credit, 2 hours.

322 *Work Analysis and Design.* Analysis, design and operation of work systems; their relationship to job evaluation and wage payment systems. Prerequisite: Junior standing or approval of instructor. Laboratory assignments. Credit, 3 hours.

335 *Engineering Law.* Influence of contract, property, and tort law upon engineering activities; contracts, agency, partnerships, corporations, liens, and expert testimony. Credit, 2 hours.

342 *Applied Math in Industrial Engineering.* Applications of methods of determinants, matrices, inequalities, series, and transforms within Industrial Engineering. Prerequisite: MA 212. Credit, 3 hours.

374 *Statistical Quality Control.* Statistical concepts; applications and methods applied to the control of quality of manufactured products. Two hours lecture, two hours laboratory. Credit, 3 hours.

375 *Computer Methods and Applications.* The use of analog and digital computers in science, engineering, and data processing. Methods of structuring problems for computers; general characteristics and performance measures of computers and auxiliary equipment. Case studies. Laboratory assignments. Credit, 3 hours.

380 *Special Topics in Industrial Engineering.* Selected topics in modern industrial engineering. Prerequisite: Approval of instructor. Credit, 3 hours.

412g *Engineering Economic Analysis.* The engineering economic audit, breakeven point analysis, variable budget control of manufacturing costs, cost analysis, and product pricing. Prerequisite: MA 120. Credit, 2 hours.

421g *Human Engineering.* Man-machine systems; design and conduct of human engineering studies. Laboratory assignments. Credit, 2 hours.

425g *Human Factors in Space Travel.* Artificial environments and environmental control of upper atmosphere and space. Laboratory assignments. Credit, 2 hours.

431g *Engineering Administration.* Engineering organization and administration; delegation of authority and responsibility; effective utilization of resources; compensation structure, labor-management relations. Credit, 3 hours.

432g *Industrial Administration.* Role of the engineer in manufacturing management. Basic functions, departmentation, authority relationships, and methods of control. Primarily for graduate students. Credit, 3 hours.

437g *Job Evaluation and Compensation.* Analysis and evaluation of work assignments; determination of compensation. Laboratory assignments. Credit, 2 hours.

439 *Supervision and Labor.* Interrelationship of supervisory personnel and employees; organization, operation, and characteristics of labor. Credit, 2 hours.

451g *Foundations for Industrial Engineering.* Engineering accounting, engineering economy, motion and time study, FORTRAN programming. Laboratory assignments. Prerequisite: Graduate standing. Credit, 3 hours.

461 *Design of Industrial Operations.* Planning, analyzing, controlling and evaluating production systems. Laboratory assignments. Prerequisites: IE 311 and IE 322, or approval of instructor. Credit, 3 hours.

462 *Design of Industrial Operations.* A continuation of IE 461, including the submission of an engineering report on a semester design project. One lecture, 6 hours laboratory. Prerequisite: IE 461. Credit, 3 hours.

463g *Industrial Automation.* Design analysis and evaluation of industrial control methodologies utilizing conventional control components and analog and digital computers. Two lectures, 3 hours laboratory. Prerequisite: Senior standing. Credit, 3 hours.

471g *Applied Probability for Engineers.* Combinatorial analysis sample space, events, probability, discrete and continuous random variables, probability distributions with applications in engineering. Laboratory assignments. Prerequisite: MA 212. Credit, 3 hours.

472g *Engineering Statistics.* Significance tests and confidence intervals, tests of hypotheses, simple and multiple regression and correlation with applications in engineering. Laboratory assignments. Prerequisite: MA 212. Credit, 3 hours.

474g *Acceptance Sampling.* Theory and application of attribute and variable acceptance sampling, multiple and sequential. Laboratory assignments. Prerequisite: IE 374 or equivalent. Credit, 3 hours.

475g *Operations Research.* Monte Carlo methods; linear programming, including transportation assignment problems; inventory and replacement models; queueing theory; dynamic programming. Laboratory assignments. Prerequisite: IE 471 or equivalent. Credit, 3 hours.

477g *System Simulation with Digital Computers.* Methods and procedures for simulating large scale systems with digital computers. FORTRAN and SIMSCRIPT programming languages are used. Laboratory assignments. Prerequisite: IE 375, EE 326 or equivalent. Credit, 3 hours.

480g *Biomechanics.* Analysis and explanation of muscular, cardiac and respiratory responses related to industrial work and fatigue. Laboratory assignments. Prerequisite: IE 421. Credit, 3 hours.

481g *Biomechanics.* Analysis and explanation of sensory and other neurological responses related to industrial work and fatigue. Laboratory assignments. Prerequisite: IE 421. Credit, 3 hours.

511 *Analysis of Decision Processes.* Methods of making economic decisions; effects of risk, uncertainty, and strategy on managerial economic decisions. Laboratory assignments. Prerequisite: IE 311 or equivalent. Credit, 3 hours.

521 *Topics in Human Engineering.* Analysis, design and control of human performance in man-machine environments; consideration of physiological and psychological factors as related to system performance. Laboratory assignments. Credit, 3 hours.

522 *Work Design.* Analysis of current problems, new approaches, and advanced concepts in work analysis and design. Laboratory assignments. Credit, 3 hours.

531 *Topics in Engineering Administration.* Consideration of qualitative and quantitative aspects. Consideration given to philosophical, psychological, political, and social implications of administrative decisions. Prerequisite: IE 431 or equivalent. Credit, 3 hours.

533 *Project Engineering.* Role of the project engineer in research and development, emphasizing the complete sequence of steps from project proposal to project completion. Analytical techniques such as CPM, PERT/COST will be considered. Laboratory assignments. Credit, 3 hours.

561 *Analysis of Industrial Operations.* An extensive and intensive analysis of industrial operations for optimum utilization of resources. Laboratory assignments. Credit, 3 hours.

562 *Management Dynamics.* Dynamic behavior of large scale enterprises.

Input-output relationships will be studied using mathematical model building and computer simulation techniques. Computer languages for simulation will be examined. Laboratory assignments. Credit, 3 hours.

563 *Topics in Mechanization and Automation.* Analysis of mechanization and automation procedures as applied to selected industrial processes; specific digital computer installations will be analyzed and evaluated. Laboratory assignments. Credit, 3 hours.

571 *Applied Probability for Engineers.* Continuation of IE 471. Prerequisite: IE 471 or equivalent. Credit, 3 hours.

572 *Engineering Statistics.* Statistical design and analysis of engineering and industrial experiments. Analysis of variance and covariance. Determination of optimum experimental conditions for maximum response. Laboratory assignments. Prerequisite: IE 472 or equivalent. Credit, 3 hours.

573 *Reliability Models.* Advanced statistical methods for determining reliability and reliability growth curves with associated confidence limits. Laboratory assignments. Prerequisite: IE 471g or equivalent. Credit, 3 hours.

574 *Mathematical Programming.* Theory and application of methods for determining the maximum and minimum of functions of many variables subject to constraints. Methods include LaGrangian multipliers, linear and dynamic programming. Laboratory assignments. Credit, 3 hours.

575 *Topics in Operations Research.* Methods and procedures for conducting effective operations research programs; application and construction of mathematical models for solving industrial problems; discussion of recent developments in operations research. Laboratory assignments. Prerequisite: IE 475. Credit, 3 hours.

576 *Queueing Theory.* Analysis of queues using analytical and Monte Carlo methods. Laboratory assignments. Prerequisite: IE 471 or equivalent. Credit, 3 hours.

577 *Systems Analysis.* General theories for the analysis of complex systerms. Macro- and micro-analysis viewpoints will be considered. Laboratory assignments. Credit, 3 hours.

578 *Inventory Theory.* Mathematical and statistical analysis of inventory, warehouse and logistic systems, application of theory of dynamic programming and stochastic processes. Laboratory assignments. Prerequisites: IE 471 and IE 475 or their equivalent. Credit, 3 hours.

580 *Current Trends in Industrial Engineering.* Evaluation of current trends in the theory and practice of industrial engineering. Credit, 3 hours.

Special Graduate Courses: 500, 590, 591, 592, 593, 594, 600, 690, 691, 692, 700, 790, 791, 792, 799. (See page 215-216.)

MECHANICAL ENGINEERING

PROFESSORS GEORGE C. BEAKLEY (EC G105), MYKLESTAD, NUTT, PRICE, RICE, STAFFORD, STEIN, TURNBOW; ASSOCIATE PROFESSORS BREGAR, COLLINS, FRY, GYOROG, LOGAN, MEIROVITCH, WATSON; ASSISTANT PROFESSORS ADAMS, AUTORE, FLORSCHUETZ, METZGER; INSTRUCTORS HAWLEY, SHEPPARD

MECHANICAL ENGINEERING

ME 102 *Introduction to Engineering.* Computational and mathematical tools useful in problem solving; units and model studies in engineering analysis; digital computer programming; elementary design considerations. One lecture, 3 hours recitation-laboratory. Credit, 2 hours.

141 *Engineering Graphics.* Engineering drawing, descriptive geometry and graphical solution techniques; spatial visualization, sketching, and current practices of industry. One lecture, 6 hours laboratory. Credit, 3 hours.

201 *Technology and Social Change.* Review of existing theories of social change, analysis of the role of technology as related to social change and studies of contemporary and possible future impacts of technology on society. Credit, 2 hours.

230 *Materials and Industrial Processes.* Modern processing techniques and equipment used in production. Properties and conversion of basic materials into consumer products. One lecture, 3 hours laboratory. Credit, 2 hours.

280 *Applied Thermodynamics.* Applications of laws of thermodynamics to combustion engines, compressors, refrigeration and vapor cycles. Not open to engineering students. Prerequisites: MA 117, PH 111. Credit, 3 hours.

300 *Man and Machine.* How the processes of mechanical invention and technical progress affected, and were in turn affected by, the evolution of social forms and institutions. Credit, 2 hours.

301, 302 *Science and Technology in History.* Important developments in the sciences and technology from earliest times; reciprocal relations of science and/or technology with the socio-economic processes and institutions; the development of science and technology. Credit, 3 hours each semester.

308 *Engineering Mathematical Analysis.* Explanation of engineering phenomena by their differential equations. Exact and approximate solutions including Fourier Series and partial differential equations. Prerequisite: MA 360 or ES 365. Credit, 3 hours.

321 *Mechanisms.* Relative motions of machine parts; cams, rolling contact, gearing, and flexible connectors. Synthesis of mechanisms. Prerequisite: ME 141. Co-requisite: ES 312. One lecture, 3 hours laboratory. Credit, 2 hours.

322 *Dynamics in Design.* Experimental mechanics; dynamic measurements; applications of dynamics in design. Prerequisites: ES 312, MA 360 or ES 365. Credit, 2 hours.

330 *Metallurgy.* Metallurgy of iron, steel and non-ferrous alloys; atomic and crystal structure; welding, brazing, and soldering. For non-engineering majors. Prerequisite: CH 114. Two lectures, 3 hours laboratory. Credit, 3 hours.

331 *Engineering Materials and Processes.* Basic properties and metallurgy of engineering materials including ferrous and non-ferrous metals and alloys; studies of cermets and plastics; production and processing of engineering materials. Prerequisite: CH 114 or KE 118. Two lectures, 3 hours laboratory. Credit, 3 hours.

332 *Manufacturing Design.* Product and process design considerations essential to design for production; coordination of functional design, materials and processes. One lecture, 3 hours laboratory. Prerequisite: ME 230 or ME 331. Credit, 2 hours.

361 *Measurement Engineering.* Fundamental theory of static and dynam-

ic measurements. Experiments correlated with theoretical discussions. Prerequisites: EE 301, ES 321. Two lectures, 1 laboratory lecture, 2 hours laboratory. Credit, 3 hours.

382 *Thermodynamics of Mechanical Systems.* Applied thermodynamics; gas mixtures, power cycles, and reactive systems. Prerequisite: ES 381. Credit, 3 hours.

401 *Theory, Prediction and Social Effects of Invention.* Invention considered as an instrument of change in civilization; evolutionary nature of inventions, cycle of growth and decline, causation and social effects; possibility, past success and art of predicting the cultural future. Prerequisite: ME 300. Credit, 3 hours.

402g *Science in History.* Examination of the reciprocal relations of science and society from ancient to recent times. Prerequisite: Twelve semester hours credit in science. Credit, 3 hours.

411g *Nuclear Engineering.* Elements of nuclear chain reactions; energy release from fission; criticality; classification of nuclear reactors; reactor systems and their control; nuclear materials; and radiation shielding. Prerequisite: ES 381. Credit, 3 hours.

412g *Nucleonics Laboratory.* Experimental investigation of characteristics of nuclear radiations and their interaction with matter; operation of apparatus for detection and measurement of nuclear radiation. Prerequisite: PH 361. Credit, 2 hours.

413g *Nuclear Reactor Engineering.* Principles of reactor design including radiation protection, heat removal, thermal stress; reactor control and instrumentation; reactor materials; power reactor economics; analysis of hazards. Prerequisite: ME 411. Co-requisite: ES 483 or equivalent. Credit, 3 hours.

414g *Radiation Hazards and Facilities.* Safe limits of exposure, tolerance dosage of alpha, beta, gamma and neutron radiation; design of safe radiation facilities. Prerequisite: PH 464 or ME 411. Credit, 3 hours.

415g *Nuclear System Design.* Engineering design of nuclear reactors with emphasis on their synthesis in systems for power generation, propulsion, and radiation processing. Prerequisite: ME 413. One lecture, 2 hours laboratory-lecture, 3 hours laboratory. Credit, 3 hours.

417g *Nuclear Engineering Laboratory.* Experiments in nuclear engineering including aspects of reactor control, heat transfer, instrumentation, and measurements; neutron distribution and dynamics in a subcritical reactor. Co-requisite: ME 413. One lecture, 3 hours laboratory. Credit, 2 hours.

422g *Space Mechanics.* Dynamics with applications to aeronautical and astronautical problems; relative motion, orbits and trajectories, resisting media. Variable mass; introduction to gyroscopic motion. Prerequisite: ES 312. Credit, 3 hours.

427g *Flight Vehicle Structures.* Space structures; thin-walled structures; load factors; non-symmetrical bending and transverse shear; shear center and shear flow; semi-monocoque construction, fuselage rings; multicelled structures; sandwich panels; fatigue. Prerequisite: ES 322. Credit, 3 hours.

432g *Metallurgy.* Extraction of metals, crystal and atomic structure, phase transformations, tests and properties of high temperature metals and refractories, and introduction to spectroscopy. Prerequisite: ME 331 or CH 441. Two lectures, 3 hours laboratory. Credit, 3 hours.

441 *Principles of Design.* Design procedures; force and motion analysis; failure modes; stress and deflection analysis; stress concentration; fatigue; selected components. Prerequisites: ES 322, ES 350, and ME 331. Credit, 3 hours.

442g *Intermediate Design.* Application of the principles and empiricisms of engineering to the creative design of machine components and subsystems. Prerequisite: ME 441. Credit, 3 hours.

443g *Aero-Space Design.* Preliminary design of aircraft and space vehicles. Prerequisites: ES 322, ME 441. Co-requisite: ES 483. One lecture, 2 hours laboratory-lecture, 3 hours laboratory. Credit, 3 hours.

445 *Preliminary Design.* Confrontation of engineering design problems at the professional level; application of principles and analytical techniques from engineering disciplines to the creative design-synthesis of selected engineering systems; concepts of formulation, simplifying assumptions, optimization techniques; consideration of performance, life, cost. Prerequisite: ME 441. Co-requisite: ES 483. One lecture, 2 hours laboratory-lecture, 3 hours laboratory. Credit, 3 hours.

450g *Aircraft Aerodynamics.* Principles of subsonic and supersonic flight; wing theory, propeller theory, control surface theory; drag determination and performance analysis; propulsion, stability and control; wind tunnel testing. Prerequisite: ES 372. Credit, 3 hours.

451g *Helicopter Aerodynamics.* Principles of rotating-wing aircraft aerodynamics; hovering theory, hovering and vertical-flight performance analysis, vertical descent, forward flight; blade motion, control, and stall prediction; stability. Prerequisite: ME 450. Credit, 3 hours.

452g *Propulsion Principles.* Mechanics of compressible flow; aerodynamics, thermodynamics, and thermochemistry of propulsion systems; chemical equilibrium; theoretical rocket engine performance, introduction to chemical kinetics of reacting fluid flow. Prerequisites: ES 371, ES 381. Credit, 3 hours.

453g *Propulsion Systems.* Analysis of jet propulsion systems for aircraft, missiles, and spacecraft. Turbojet, turboprop, ramjet, chemical rocket, nuclear rocket, ion, plasma and photon engines. Prerequisite: ME 452 or permission of instructor. Credit, 3 hours.

455g *Gas Turbines.* Thermodynamic analysis of gas turbine plants; analysis of flow in turbines and compressors; blade losses; combustion, turbine and compressor matching; off-design performance; design consideration. Prerequisite: ME 382. Credit, 3 hours.

462g *Measurement Engineering.* Extension of fundamental measurement principles; discussion of DC, sine wave and pulse carrier systems and of unbalance and reference-balance measuring methods; simple computing-type transducer. Prerequisite: ME 361. One lecture, 1 hour laboratory-lecture, 2 hours laboratory. Credit, 2 hours.

463g *Transducer Principles.* Transducers for measuring systems; advantages, limitations and applications of various mechanical, electrical, magnetic, optical, thermal transducing principles. Prerequisite: ME 361. Co-requisite: ME 462. Two lectures, 3 hours laboratory. Credit, 3 hours.

465g *Automatic Controls.* Theory of control systems including open-loop and closed-loop, with emphasis on mechanical, hydraulic, thermal, and pneumatic systems; application of the analog computer to the solution of differential equations. Prerequisite: MA 360 or ES 365. Credit, 3 hours.

483 *Internal Combustion Engines.* Application of thermodynamics, fluid mechanics, and chemistry to internal combustion engines; performance characteristics, combustion, carburetion, cooling, and controls. Prerequisite: ES 371. Credit, 3 hours.

484g *Conventional Power Systems.* Fundamentals of thermochemical reactions; engineering design and economics of conventional energy conversion systems including steam power plants, internal combustion engines, gas turbines, and electromechanical devices. Prerequisite: ME 382. Credit, 2 hours.

485g *Momentum, Energy, and Mass Transfer.* Analogous treatment of principles and engineering applications of viscous fluid flow; conduction, convective heat transfer, and mass diffusion processes. Prerequisites: ES 483, ME 382. Credit, 3 hours.

486g *Environmental Control.* Refrigeration cycles, refrigerant properties, heating, cooling loads; psychrometry; processes for heating, cooling, humidifying, dehumidifying, purifying; heat transfer principles; controls. Prerequisite: ME 382. Credit, 3 hours.

487g *Energy Conversion.* Unconventional methods of energy conversion; particular emphasis on fuel cells, thermoelectrics, thermionics, solar energy, photovoltaics, nuclear, and magnetohydrodynamics. Prerequisites: PH 361, ME 382, or permission of instructor. Credit, 3 hours.

491 *Experimental Mechanical Engineering.* Laboratory practice and demonstrations in fluid mechanics, dynamics, heat transfer, materials testing and energy conversion. Prerequisites: ME 361 and ME 382. Co-requisites: ES 483 and ES 421. Six hours laboratory. Credit, 2 hours.

492 *Mechanical Engineering Projects.* Experimental and/or design projects in the general areas of energy conversion, aero-space engineering, measurements, automatic controls, or systems design. Prerequisite: ME 491. Six hours laboratory. Credit, 2 hours.

512 *Reactor Theory.* Neutron motion and reactor behavior; transport and diffusion theory. Prerequisite: ME 411. Credit, 3 hours.

513 *Radiation Processing.* Radiation principles and facilities, pasteurization, sterilization, vulcanization, and chemical processing. Prerequisite: ME 414. Credit, 3 hours.

514 *Reactor Design.* Various factors of reactor design coordinated in a system analysis with a hazard evaluation. Prerequisite: ME 413. Credit, 3 hours.

515 *Materials Processing.* Processing nuclear fuels and products; storage and handling. Prerequisite: ME 413. Credit, 3 hours.

524 *Space Vehicle Dynamics.* Satellite orbits, rendezvous problems, ballistic trajectories, gyroscopic instruments; space vehicle motion, flight trajectory optimization; missile dynamics analysis. Prerequisite: ES 513. Credit, 3 hours.

527 *Aeroelasticity.* Mutual interaction between aerodynamic forces and

elastic forces and deflection induced in the structures, control mechanisms, and propulsion systems of flight vehicles. Prerequisite: ES 322 or permission of instructor. Credit, 3 hours.

544 *Mechanical Design.* Application of principles of elasticity and plasticity in multiaxial states-of-stress to design synthesis; failure theories; fatigue analysis. Prerequisite: ME 445 or permission of instructor. Credit, 3 hours.

545 *Mechanical-failure Analysis.* Principles, concepts, phenomenological theories, and techniques of analysis associated with failure prevention in mechanical design; fatigue, creep, combined fatigue and creep, and impact. Prerequisite: ME 544 or permission of instructor. Credit, 3 hours.

551 *Missile Aerodynamics.* Slender-body theory at supersonic and subsonic speeds; flow patterns; wing-body and wing-tail interference; stability and control; drag and aerodynamic heating. Prerequisite: ES 572. Credit, 3 hours.

552 *Aerothermochemistry.* Chemical aspects of reacting gas flow systems, including atomic and molecular structure, heats of formation, chemical equilibrium, elements of statistical thermodynamics and properties of atomic and molecular gases, classical chemical kinetics, gas dynamics with reacting mixtures, transport properties, laminar and diffusion flames and detonation. Prerequisites: ES 371, ES 381. Credit, 3 hours.

553 *Aerophysics.* Molecular theories of rarified gases; non-equilibrium aspects of gas dynamics, chemical and vibrational relaxation; spectral radiation properties of high temperature equilibrium and non-equilibrium flows. Prerequisites: ME 452, ME 552 or permission of instructor. Credit, 3 hours.

554 *Space Propulsion Systems.* Principles of chemical and nuclear rockets; plasma jets and accelerators; ion and photon engines; evaluation of space mission requirements and propulsion system performance. Prerequisite: ME 452 or ME 453 or permission of instructor. Credit, 3 hours.

555 *Turbomachinery.* Principles of aerothermodynamics and flow of fluids in arbitrarily shaped stationary and rotating passages of turbomachines; one, two, and three-dimensional analyses of turbomachinery flow fields; boundary layers and loss mechanisms. Prerequisite: ME 455. Credit, 3 hours.

561 *Systems Engineering.* Application of project engineering techniques and the synthesis of model solutions; integration of concepts studied in mathematics and the engineering sciences. Credit, 3 hours.

562 *System Control.* Theory and analysis of system controls. Prerequisite: ME 561. Credit, 3 hours.

563 *Mechanical Computers.* Use of mechanical elements in the formation of computer systems. Prerequisite: ME 561. Credit, 3 hours.

564 *Experimental Stress Analysis.* Measurement of static and dynamic stresses in models and prototypes. Brittle analogs and coatings, photoelastic analogs and coatings, membrane analogy, interaction methods, electrical analogy, strain gages of mechanical and electrical nature. Prerequisite: ME 361. Three lectures, 3 hours laboratory. Credit, 3 hours.

572 *Two Phase Flow and Energy Transfer.* Classification and characteristics of two phase flows; energy transfer with emphasis on boiling heat

transfer. Selected topics include: pressure drop in single and multicomponent gas-fluid flows, bubble ebullition models, natural and forced-convection boiling characteristics, burnout phenomena and condensation. Prerequisite: permission of instructor. Credit, 3 hours.

586 *Combustion.* Thermodynamics, gas dymamics and chemical kinetics of combustion processes, premixed and diffusion flames, detonations; solid and liquid fuels and propellants, burner design considerations, smoke formation. Prerequisite: ES 483. Credit, 3 hours.

Special Graduate Courses: 500, 590, 591, 592, 593, 594, 600, 691, 692, 700, 790, 791, 792, 799. (See page 215-216.)

ENGLISH

PROFESSORS ARCHER (LL 501), CONLIN, HARRIS, LAMBERTS, LEVY, MYERS, PORTNOFF, SCHILLING, TURNER, ZIMMERMAN; ASSOCIATE PROFESSORS ELLIS, EMERY, ERNO, FERRELL, FISHER, LANDINI, MONTAGUE, OSENBURG, RATLIFF; ASSISTANT PROFESSORS BAROODY, COLBY, EVANS, GRUNDY, HENSHAW, HERMAN, HURTGEN, KEENAN, LIGHTFOOT, LYLE, MELDRUM, MORAN, NEBEKER, POWERS, RANDALL, SALERNO, SLATTERY, TAYLOR; INSTRUCTORS BROSE, BROWN, CROOKS, HARRIES, HIRSCH, K. HURST, INGLISH, QUIRK, YOUNGBLOOD

DEPARTMENTAL MAJOR REQUIREMENTS—

BACHELOR OF ARTS DEGREE CURRICULUM

ENGLISH—consists of 45 semester hours of credit, of which 30 must be in English, and 15 in no more than two related fields (drama, speech, history, psychology, etc.) to be selected by the student in consultation with the adviser. Required courses are EN 221 and 222; EN 321 or 421 or 422; EN 423 or 424; EN 312 or 314 or 413; two period courses; one types course. At least 18 hours must be in upper division courses.

DEPARTMENTAL MAJOR TEACHING FIELD REQUIREMENTS—

BACHELOR OF ARTS IN EDUCATION DEGREE CURRICULUM

ENGLISH—consists of 45 semester hours of credit in English. Required courses are EN 101, 102, 151, 211 or 212, 221, 222, 312 or 314, 313, 341 or 342, 471, 480, and nine hours of upper division electives. Upper division courses in related fields may be accepted as electives with the approval of the adviser.

DEPARTMENTAL GRADUATE PROGRAMS—

The Department of English offers programs leading to the degrees of Master of Arts and Doctor of Philosophy. Consult the Graduate Catalog for requirements.

ENGLISH

EN 101 *First Year English.* Composition; emphasis on paragraph structure, correctness in English fundamentals, exactness and concreteness of statement; dictionary and library practice; intensive and extensive reading. Credit, 3 hours.

102 *First Year English.* Expository writing; emphasis on organizing and unifying long papers, improvement in style, expansion of vocabulary. Introduction to word study; practice in research, including the writing of a model term paper. Intensive and extensive reading. Prerequisite: EN 101. Credit, 3 hours.

103 *Introduction to Literature.* An introduction to literature through literary types, designed for students not majoring in English. Selections taken mainly from modern writers. Credit, 3 hours.

104 *Advanced First Year English.* Composition, with emphasis on refining writing skills; intensive reading; research papers; logic. Prerequisite: Passing grade on the EN 101 exemption examination. Credit, 3 hours.

111 *English for Foreign Students.* For foreign students from non-English speaking countries who have studied English in their native countries, but who require practice in the idioms of English. Intensive reading, writing, and discussion to acquaint students with the colloquial flavor of English. Satisfies the graduation requirement of EN 101. Credit, 3 hours.

112 *English for Foreign Students.* Reading on a broader scope and more emphasis on composition. Satisfies the graduation requirement of EN 102. Prerequisite: EN 111. Credit, 3 hours.

151, 152 *Directed Reading for English Majors and Minors.* Supervised reading with a weekly individual conference with instructor. Credit, 1 hour each semester.

201 *World Literature — The Classical and Medieval Periods.* Selections from the great literature of the world in translation and lectures on the cultural background of the writings. Prerequisite: EN 101. Credit, 3 hours.

202 *World Literature—The Renaissance and Modern Periods.* Selections from the great literature of the world in translation and lectures on the cultural background of the writings. Prerequisite: EN 101. Credit, 3 hours.

204 *Literature of Today.* Poetry, short story, novel, and drama. Not for English majors. Not open to freshmen. Credit, 3 hours.

211 *Advanced Composition.* For students interested in further training in organization and expression of ideas. Primarily for non-English majors. Prerequisite: EN 102. Two lectures, conferences arranged. Credit, 3 hours.

212 *English Prose Style.* Advanced training in various types of prose writing. Prerequisite: Grade of "B" in EN 102. Two lectures, conferences arranged. Credit, 3 hours.

221 *Survey of English Literature.* The content and form of the earlier English literature, including a study of the individual and national characteristics of certain authors. Prerequisite: EN 102. Primarily for English majors and minors. Credit, 3 hours.

222 *Survey of English Literature.* Based upon the later English literature. Prerequisite: EN 102. Primarily for English majors and minors. Credit, 3 hours.

300 *History of Literary Criticism.* Major critical theories and methods from Aristotle to Eliot. Credit, 3 hours.

311 *Creative Writing.* Writing laboratory. Lectures and conferences dealing with the various forms of imaginative writing. Prerequisite: EN 211 or recommendation of instructor in EN 102. Two lectures, conferences arranged. Credit, 3 hours.

312 *Current English Usage.* Recent changes and current trends in the language, with emphasis on American English and the factual basis of grammar. Prerequisite: EN 102. Credit, 3 hours.

313 *Introduction to Semantics.* Nature of meaning and the function of language, designed to improve accuracy of communication and to provide a technique for analyzing false or misleading statements. Prerequisite: Junior standing. Credit, 2 hours.

314 *Modern Grammar.* Conventional, structural, and generative grammars with implications for high school English teachers. Credit, 3 hours.

320 *Tudor Literature.* English prose and poetry, 1485-1603, exclusive of the drama. Prerequisite: EN 221. Credit, 3 hours.

321 *Introduction to Shakespeare.* Shakespeare's major comedies, histories, and tragedies. Credit, 3 hours.

322 *Jacobean and Caroline Literature.* English prose and poetry, 1603-1660, exclusive of Milton and the drama. Prerequisite: EN 221. Credit, 3 hours.

326 *Nineteenth Century Prose.* Romantic and Victorian prose, exclusive of the novel. Prerequisite: EN 222. Credit, 3 hours.

341 *American Literature.* From colonial times to the Civil War, including the growth of nationalism and the rise of the New England school. Open to those specializing in other departments who have junior standing. Prerequisite: EN 102. Credit, 3 hours.

342 *American Literature.* From Whitman to the present. The influence of westward expansion, the growth of regionalism, the literature of social protest. Open to those specializing in other departments who have junior standing. Prerequisite: EN 102. Credit, 3 hours.

352 *Short Story.* The development of the short story as a literary form; analysis of its technique through study of examples from the work of representative authors. Prerequisite: Three hours of literature. Credit, 3 hours.

355 *History of the Drama.* The English drama from the Middle Ages to the present, with selective examples of foreign influences. Reading of representative plays of each period. Credit, 3 hours.

356 *Biblical Backgrounds of Literature.* The reading of the Old and New Testaments with emphasis on types and ideas used as primary or major sources in literature. Credit, 3 hours.

411g *Advanced Creative Writing.* Prerequisite: EN 311 or approval of instructor. Two lectures, conferences arranged. Credit, 3 hours.

412g *Professional Writing.* Lectures and conferences concerning techniques of writing for publication. Prerequisite: EN 311 or approval of instructor. Two lectures, conferences arranged. Credit, 3 hours.

413g *History of the English Language.* Development of the language from the earliest times to the modern period. Prerequisites: EN 211, 221. Credit, 3 hours.

420g *Renaissance Drama.* Plays of Elizabethan, Jacobean and Caroline dramatists, excluding Shakespeare. Prerequisite: EN 221. Credit, 3 hours.

421g *Shakespeare: The Tragedies.* Critical study of the major tragedies. An introduction to Shakespearean scholarship. Prerequisite: EN 211. Credit, 3 hours.

422g *Shakespeare: The Comedies.* A rapid reading of all the comedies. Studies of the comic spirit and Shakespeare's comic genius. Prerequisite: EN 221. Credit, 3 hours.

423g *Milton.* The life of Milton, his relation to the literary and social background of his period, and textual study of his chief works. Prerequisite: EN 221. Credit, 3 hours.

424g *Chaucer.* Chaucer's language, poetry and intellectual background. Prerequisite: EN 221. Credit, 3 hours.

425g *Nineteenth Century Poetry: Romantic Period.* The poetry of Wordsworth, Coleridge, Shelley, Keats, Byron. Prerequisite: EN 222. Credit, 3 hours.

426g *Nineteenth Century Poetry: Victorian Period.* The poetry of the second half of the century. Special study of Tennyson, Browning, Arnold. Prerequisite: EN 222. Credit, 3 hours.

427g *Age of Johnson.* The chief writers, movements, and books during Johnson's career as a dominating literary figure, together with their most important relationships to predecessors and followers. Prerequisites: EN 221, 222. Credit, 3 hours.

428g *Age of Satire.* English satirists of the Restoration and early 18th century: Dryden, Pope, Swift, and others. Prerequisite: EN 222. Credit, 3 hours.

441g *Contemporary American Drama.* The American Drama since World War I, with special attention to experimental techniques. Prerequisite: EN 222 or equivalent. Credit, 3 hours.

442g *Contemporary British Poetry.* British poetry of the 20th century: techniques, aims, and significance. Prerequisite: Three hours of literature. Credit, 3 hours.

443g *Contemporary American Poetry.* American poetry of the 20th century: techniques, aims, and significance. Prerequisite: Three hours of literature. Credit, 3 hours.

444g *American Romanticism.* 1830-60. The chief American Transcendentalists and Romanticists. Prerequisite: EN 341 or 342. Credit, 3 hours.

445g *American Realism.* 1860-1900. Literary realism as expressed in the critical essay, short story, and poetry, with attention to European influences. Prerequisite: EN 341 or 342. Credit, 3 hours.

446g *Twentieth Century American Novel.* The American novel since Dreiser. Prerequisite: Three hours of literature. Credit, 3 hours.

448g *Twentieth Century British Novel.* The 20th century British novel since 1914. Prerequisite: Three hours of literature. Credit, 3 hours.

451g *Development of the Novel: 18th Century.* From the origins of prose fiction to Scott. Prerequisite: EN 221. Credit, 3 hours.

452g *Development of the Novel: 19th Century.* From Scott to Conrad. Prerequisite: EN 222. Credit, 3 hours.

453g *The American Novel to Dreiser.* The sentimental, romantic, realistic, and naturalistic novels in America. Prerequisite: EN 341 or 342. Credit, 3 hours.

454g *Modern Drama.* The chief dramatic writers of the modern period, with special attention to experimental techniques. Prerequisite: EN 222 or equivalent. Credit, 3 hours.

455g *The Form of Verse: Theory and Practice.* The types, history, criticism, and schools of theory of metrical form. Analysis of lyric, narrative, and dramatic poetry. Original verse writing optional. Prerequisite: One semester survey of American or British literature, or equivalent. Credit, 2 hours.

456g *Classical Background of English Literature.* The myths and legends of Greece and Rome and some of the works in which they appear. Credit, 2 hours.

460g *Literature of the Southwest.* The literature, folklore and traditions of the American Southwest. Credit, 3 hours.

471g *Literature for Junior and Senior High School Students.* Prose and poetry which meet the interests, desires and capabilities of the high school boy and girl. Recent literature stressed. Prerequisite: EN 222. Credit, 3 hours.

480g *Methods of Teaching English.* Methods of instruction, organization, and presentation of appropriate content in English. Prerequisite: 2-SE 311 or concurrently. Credit, 3 hours.

491g *Backgrounds of English Literature.* Lectures and individual study in England, France, and Italy. Tour fee to be arranged. Credit, 3 hours.

500 *Research Methods.* Credit, 3 hours.

507 *Old English.* The elements of Old English grammar, with selected readings. Credit, 3 hours.

508 *Beowulf.* Intensive literary and linguistic study of Beowulf. Prerequisite: EN 507. Credit, 3 hours.

510 *The Structure of English.* Analysis of the structural patterns of English from both the grammatical and linguistic points of view. Prerequisite: EN 312. Credit, 3 hours.

511 *Theory and Practice of Rhetoric.* Students will be required to demonstrate their grasp of stylistic theory by doing at least competent apprentice work in various assigned forms. Prerequisite: EN 510, or approval of department chairman. Credit, 3 hours.

520 *Renaissance Literature.* Poetry and prose of the English Renaissance, excluding drama. Prerequisite: EN 221. Credit, 3 hours.

540 *American Literature to* 1815. Thought and expression from the time of the first English-speaking colonies to 1815. Prerequisite: EN 341 or approval of department chairman. Credit, 3 hours.

550 *Contemporary Comparative Literature.* Current trends in American and other literatures with emphasis on their significance in contemporary thought. Credit, 3 hours.

591 *Seminar.* Topics will be selected from the following:
- (a) *Old English.* Credit, 3 hours.
- (b) *Middle English.* Credit, 3 hours.
- (c) *Literary Criticism.* Credit, 3 hours.
- (d) *Renaissance Poetry to* 1600. Credit, 3 hours.
- (e) *Seventeenth Century Literature.* Credit, 3 hours.
- (f) *English Romanticism.* Credit, 3 hours.
- (g) *Victorian Literature.* Credit, 3 hours.
- (h) *Neo-Classicists, Sentimentalists, and Early Romanticists.* Credit, 3 hours.
- (i) *Techniques of the Novel.* Credit, 3 hours.

(j) *Twentieth Century British and American Poetry.* Credit, 3 hours.
(k) *Drama.* Credit, 3 hours.
(l) *American Literature.* Credit, 3 hours.
(m) *American Poetry.* Credit, 3 hours.
(n) *Nineteenth Century American Fictional Techniques.* Credit, 3 hours.
(o) *Contemporary Southern Writing.* Credit, 3 hours.
(p) *Composition for Graduate Assistants.* Credit, 3 hours.

FOREIGN LANGUAGES

PROFESSORS VAN SCOY (LL 403), BOWMAN, BUFFINGTON, PALFREY; ASSOCIATE PROFESSORS BININGER, ESCUDERO, GROBE, LUENOW, MARTINEZ, VON DER HEYDT, WIRTZ; ASSISTANT PROFESSORS ACEVEDO, CARLSON, CARVER, COUCH, EKMANIS, KNOWLTON, LAETZ, LANDEIRA, MCINTIRE, RADKE, RANDOLPH, SIMMONS, VIRGILLO, WALLACE, WOLLAM

DEPARTMENTAL MAJOR REQUIREMENTS—

BACHELOR OF ARTS DEGREE CURRICULUM

FRENCH, GERMAN, RUSSIAN, SPANISH—consists of 45 semester hours of credit, of which 30 must be in one language, and 15 in closely related fields to be approved by the adviser in consultation with the student. The 30 hours must be above the 102 level and include the 321, 322 courses. At least 18 semester hours must be in upper division courses.

DEPARTMENTAL MAJOR TEACHING FIELD REQUIREMENTS—

BACHELOR OF ARTS IN EDUCATION DEGREE CURRICULUM

FRENCH, GERMAN, RUSSIAN, SPANISH—consists of 45 semester hours of credit, of which 30 must be in one language, and 15 in closely related fields to be approved by the adviser in consultation with the student. The 30 hours must be above the 102 level and include the 321, 322 courses and FL 480.

DEPARTMENTAL GRADUATE PROGRAMS—

The Department of Foreign Languages offers programs in French, German and Spanish leading to the degree of Master of Arts. Consult the Graduate Catalog for requirements.

PLACEMENT

With regard to placement of students who have high school language training, the policy of the department is as follows:

Normally, one year of secondary school language satisfies the prerequisite for a 102 course, and two years of one language satisfies the prerequisite for a 201 course. However, students with low marks, and those whose language study has been interrupted for a number of years, may profit by enrolling in the beginning course.

Students with three years of a high school foreign language may enter either the Advanced Composition and Conversation course or the intermediate course. Four-year students should enroll in 300 level courses.

LANGUAGE LABORATORY REQUIREMENT

All students enrolled in 101, 102, 201, and 202 courses in French, German, Russian and Spanish must spend a minimum of one hour per week in the language laboratory in addition to the four regular class periods.

FOREIGN LANGUAGES

FL 100 *Introduction to Foreign Languages.* The significance of languages in society, including study of the history of language, family relationships existing among languages, word relationships, and meanings. Emphasis upon languages of Western Europe with some reference to Slavic and Oriental tongues. Credit, 2 hours.

421 *Directed Reading for Foreign Language Majors.* Supervised reading with a weekly individual conference with instructor. Prerequisite: Six hours in upper division courses. Credit, 2 hours.

480g *Methods of Teaching Foreign Languages.* Methods of instruction, organization and presentation of appropriate content in Foreign Languages. Prerequisites: Twelve hours of upper division courses in one foreign language and 2-SE 311 or concurrently. Credit, 3 hours.

500 *Research Methods.* Required of all graduate students. Credit, 3 hours.

FRENCH

FR 101, 102 *Elementary French.* Intensive oral-aural drill in class and laboratory, and a study of basic grammar supplemented by simple prose readings. Four lectures, 1 hour laboratory. Credit, 4 hours each semester.

201, 202 *Intermediate French.* Continued oral practice, grammar review, readings in modern French literature. Prerequisite: FR 102 or equivalent. Four lectures, 1 hour laboratory. Credit, 4 hours each semester.

311, 312 *French Composition and Conversation.* Further practice in writing and speaking French, emphasizing current usage and promoting facility in the expression of ideas. Prerequisite: FR 202 or approval of instructor. Credit, 3 hours each semester.

321, 322 *French Literature.* Representative masterpieces and significant movements of French Literature. Prerequisite: FR 202 or approval of instructor. Credit, 3 hours each semester.

411g *Advanced Spoken French.* Improvement of French diction and fluency, with systematic study of phonetics. Prerequisites: FR 311, 312, or approval of instructor. Credit, 2 hours.

412g *Advanced Written French.* Improvement of composition skills. Prerequisites: FR 311, 312, or approval of instructor. Credit, 2 hours.

441g *French Literature of the 17th Century.* From 1600 to 1660. Prerequisite: FR 322. Credit, 3 hours.

442g *French Literature of the 17th Century.* From 1660 to 1700. Prerequisite: FR 322. Credit, 3 hours.

445g *French Literature of the 18th Century.* The contributions of the *philosophes,* the development of the novel and drama. Prerequisite: FR 322 or approval of instructor. Credit, 3 hours.

451g *French Literature of the 19th Century.* From 1800 to 1850. Prerequisite: FR 322. Credit, 3 hours.

452g *French Literature of the 19th Century.* From 1850 to 1900. Prerequisite: FR 322. Credit, 3 hours.

461g *Twentieth Century French Drama.* Developments in contemporary French theater, including the surrealistic theater and the theater of the absurd. Prerequisite: FR 322. Credit, 3 hours.

462g *Twentieth Century French Prose Literature.* Techniques and philosophy of the contemporary novel, studies in the modern essay. Prerequisite: FR 322. Credit, 3 hours.

511 *French Stylistics.* The art of writing literary French, comparative stylistics. Credit, 3 hours.

521 *History of the French Language.* The principal phonological, morphological, and semantic developments of French from its Latin origins to the present. Prerequisite: Some familiarity with Latin recommended. Credit, 3 hours.

523 *History of the French Drama.* From its origins to Romanticism, with special emphasis on the classical period. Credit, 3 hours.

524 *The Modern French Drama.* Representative dramatists of the 19th and 20th centuries. Credit, 3 hours.

525, 526 *History of the French Novel.* From its beginnings to the present. Credit, 3 hours each semester.

527 *History of French Lyric Poetry.* From the Middle Ages to 1900. Credit, 3 hours.

528 *History of French Lyric Poetry.* From 1900 to the present. Credit, 3 hours.

531 *Medieval French Literature.* Readings in the epic, early drama, troubadour poetry, *roman courtois* and other representative literary genres of the Middle Ages. Prerequisite: FR 521. Credit, 3 hours.

535 *French Literature of the 16th Century.* Readings in French Renaissance literature with special attention to the humanist movement and to Rabelais, Montaigne, and the Pleiade. Credit, 3 hours.

591 *Seminar.* Topics will be selected from the following:
- (a) *French Literary Criticism.* Credit, 3 hours.
- (b) *Corneille, Moliere and Racine.* Credit, 3 hours.
- (c) *Diderot, Voltaire and Rousseau.* Credit, 3 hours.
- (d) *Balzac.* Credit, 3 hours.
- (e) *Romanticism.* Credit, 3 hours.
- (f) *Proust.* Credit, 3 hours.
- (g) *Realism and Naturalism.* Credit, 3 hours.
- (h) *French Existentialist Literature.* Credit, 3 hours.

GERMAN

GR 101, 102 *Elementary German.* Emphasis on pronunciation, conversation, grammar and reading. Four lectures, 1 hour laboratory. Credit, 4 hours each semester.

201, 202 *Intermediate German.* Intensive review of grammar; increased emphasis on conversation; readings in contemporary prose. Prerequisite: GR 102 or equivalent. Four lectures, 1 hour laboratory. Credit, 4 hours each semester.

311, 312 *German Composition and Conversation.* Development of writing ability and oral expression. Prerequisite: GR 202. Credit, 3 hours each semester.

321, 322 *German Literature.* Masterpieces of significant movements of German literature from the beginning to the present. Prerequisite: GR 202 or approval of instructor. Credit, 3 hours each semester.

411g, 412g *Advanced Grammar and Conversation.* Intensive study of sentence structure and idioms by means of readings in German literature and original compositions. Prerequisite: GR 312. Credit, 2 hours each semester.

445g *Classicism.* Literary trends of the 18th century with emphasis on Lessing, Wieland, Klopstock, Schiller, Goethe, and Herder. Prerequisite: GR 322. Credit, 3 hours.

451g *Romanticism and Realism.* The major prose and dramatic works of the periods. Prerequisite: GR 322. Credit, 3 hours.

455g *German Poetry.* Major trends in German poetry with emphasis on the writers of the 18th, 19th and 20th centuries. Prerequisite: GR 322. Credit, 3 hours.

461g *Contemporary German Literature.* Naturalism to the present. Prerequisite: GR 322. Credit, 3 hours.

511 *German Stylistics.* The art of writing literary German, comparative stylistics. Credit, 3 hours.

521 *History of the German Language.* Morphological development of German from the earliest records to the present. Credit, 3 hours.

523 *The German Drama.* The drama of the 19th and 20th centuries. Credit, 3 hours.

525 *The German Novel.* From Goethe to Thomas Mann. Credit, 3 hours.

527 *The "Novelle."* The shorter prose works of the 19th and 20th centuries. Credit, 3 hours.

531 *Middle High German Literature.* Interpretation of Middle High German texts in modern German translations. Credit, 3 hours.

535 *Renaissance and Reformation.* Literary, historical, and religious problems of the "Age of Luther." Credit, 3 hours.

541 *Baroque.* Studies in the poetry, prose, and drama of the 17th and early 18th centuries. Credit, 3 hours.

545 *Goethe's FAUST.* Background and genesis of the Faust tradition with readings and interpretation of the text. Credit, 3 hours.

591 *Seminar.* Topics will be selected from the following:
- (a) *Lessing.* Credit, 3 hours.
- (b) *Goethe.* Credit, 3 hours.
- (c) *Schiller.* Credit, 3 hours.
- (d) *Mann.* Credit, 3 hours.
- (e) *Hauptmann.* Credit, 3 hours.
- (f) *Kleist.* Credit, 3 hours.
- (g) *Hebbel.* Credit, 3 hours.

GREEK

GK 101, 102 *Elementary Greek.* For beginning students only. Credit, 4 hours each semester.

LATIN

LA 101, 102 *Elementary Latin.* For beginning students only. Credit, 4 hours each semester.

201, 202 *Intermediate Latin.* Readings from the orations of Cicero; and selections from Ovid or other authors. Prerequisite: LA 102. Credit, 4 hours each semester.

321, 322 *Roman Literature.* Representative masterpieces of Roman literature from the earliest extant works through the literature of the Augustan Age. Prerequisite: LA 202 or approval of instructor. Credit, 3 hours each semester.

PORTUGUESE

PG 101, 102 *Elementary Portuguese.* Basic grammar with intensive drill in class and laboratory directed toward conversational fluency. Five lectures, 1 hour laboratory. Credit, 5 hours each semester.

211, 212 *Portuguese Composition and Conversation.* Practice in writing and speaking Portuguese, emphasizing current usage. Reports and compositions on current topics, history and culture of Brazil and Portugal. Prerequisite: PG 102 or equivalent. Credit, 3 hours each semester.

321, 322 *Luso-Brazilian Literature.* Representative masterpieces of Portuguese and Brazilian literature from the beginning to the present. Prerequisite: PG 212 or equivalent. Credit, 3 hours each semester.

RUSSIAN

RU 101, 102 *Elementary Russian.* Structural grammar and basic vocabulary. Introduction and reinforcement of aural/oral reading and writing skills. Four lectures, 1 hour laboratory. Credit, 4 hours each semester.

201, 202 *Intermediate Russian.* Systematic review of grammar. Development of vocabulary through reading, writing. Drill in aural/oral skills. Prerequisite: RU 102 or equivalent. Four lectures, 1 hour laboratory. Credit, 4 hours each semester.

203 *Scientific Russian.* Acquisition of scientific vocabulary through readings from current Soviet scientific publications. Prerequisite: RU 201. Credit, 3 hours.

211, 212 *Basic Russian Conversation.* Intensive aural/oral drill to supplement reading and grammatical skills acquired in RU 101, 102 and RU 201, 202. Required of Russian majors. Prerequisite: RU 102. Credit, 2 hours each semester.

311, 312 *Russian Composition and Conversation.* Development of writing ability and oral expression. Prerequisite: RU 202. Credit, 3 hours each semester.

321, 322 *Russian Literature.* The most significant works, authors, and literary movements of Russian and Soviet literature. Prerequisite: RU 202. Credit, 3 hours each semester.

411g, 412g *Advanced Composition and Conversation.* Designed to improve aural discrimination, self-expression in oral and written skills, with special emphasis on vocabulary building. Subject materials drawn from current Soviet publications. Prerequisite: RU 312. Credit, 3 hours each semester.

417g, 418g *Applied Russian Phonetics.* General improvement in the student's language skills through aural/oral training in Russian phonology and an analysis of Russian orthography. Prerequisite: RU 312. Credit, 2 hours each semester.

SPANISH

SP 101, 102 *Elementary Spanish.* Basic fundamentals of the language. Four lectures, 1 hour laboratory. Credit, 4 hours each semester.

201, 202 *Intermediate Spanish.* Intensive review of fundamentals plus composition, reading and conversation. Prerequisite: SP 102. Four lectures, 1 hour laboratory. Credit, 4 hours each semester.

311, 312 *Advanced Spanish Conversation.* Designed to promote facility in coherent and expressive diction in Spanish. Prerequisite: SP 202 or equivalent. Credit, 3 hours each semester.

313, 314 *Advanced Spanish Composition.* Designed to develop skill and accuracy in written Spanish. Special emphasis on structure and form. Prerequisite: SP 202 or equivalent. Credit, 3 hours each semester.

321, 322 *Spanish Literature.* Spanish literature from its beginnings to the present with some emphasis on the evolution of Spanish thought and literary ideals. Prerequisite: SP 202 or approval of instructor. Credit, 3 hours each semester.

417g *Spanish Phonetics.* Pronunciation and articulation of the Spanish language. Emphasis on problems of articulation in the Spanish-speaking Southwest. Prerequisite: Three semesters of any 300 level courses in Spanish. Credit, 3 hours.

427g, 428g *Spanish-American Literature.* The significant literature and writers from the colonial period to the present. Prerequisite: SP 322. Credit, 3 hours each semester.

429g *El Modernismo.* The renaissance in poetry and poetic prose derived from influences of the French Parnassians and certain American, British, and German writers. Prerequisite: SP 322. Credit, 3 hours.

443g *Life and Works of Cervantes.* The life and works of Cervantes with emphasis on *Don Quixote.* Lectures, readings and a term paper. Prerequisite: Twelve hours in upper division courses. Credit, 3 hours.

445g *Seventeenth Century Dramatic Literature.* From Lope de Vega to Calderon de la Barca. Prerequisite: SP 322. Credit, 3 hours.

451g *Spanish Romanticism.* The Romantic drama, poetry and prose of the 19th century. Prerequisite: SP 322. Credit, 3 hours.

455g *The Regional Novel.* The development of the regional novel with analysis of the outstanding work of each of the main regional novelists. Prerequisite: SP 322. Credit, 3 hours.

461g *Spanish Literature of the 20th Century.* Development of the contemporary essay in its various aspects of revision of values and ideas for national reconstruction as seen in the works of the Generation of 1898 and its continuators. Prerequisite: SP 322. Credit, 3 hours.

462g *Spanish Literature of the 20th Century.* Emphasis upon the works of contemporary novelists and poets. Prerequisite: SP 322. Credit, 3 hours.

472g *Spanish-American Civilization.* The people, the growth of their institutions and culture, and the aspirations of their great men. A knowledge of Spanish is not necessary. Credit, 3 hours.

485g *Spanish for Elementary Teachers.* Designed for teachers interested in introducing the teaching of Spanish in the elementary grades. Integrates the techniques of teaching with the fundamentals of Spanish. Credit, 3 hours.

486g *Spanish for Elementary Teachers.* Prerequisite: SP 485. Credit, 3 hours.

487g *Spanish for Elementary Teachers.* Prerequisite: SP 486. Credit, 3 hours.

488g *Spanish for Elementary Teachers.* Prerequisite: SP 487. Credit, 3 hours.

511 *Spanish Stylistics.* The art of writing literary Spanish, comparative stylistics. Credit, 3 hours.

523 *El Drama Anterior a Lope de Vega.* Spanish dramatic literature from Encina to Cervantes. Credit, 3 hours.

524 *The Modern Spanish Drama.* Spanish dramatic literature from Benavente to the contemporary dramatists. Credit, 3 hours.

525, 526 *History of the Spanish Novel.* From its beginnings to the present. Reading of representative works of the different periods. Credit, 3 hours each semester.

527 *Early Spanish Lyric Poetry.* From the Middle Ages to 1800. Credit, 3 hours.

528 *Modern Spanish Lyric Poetry.* From 1800 to the present. Credit, 3 hours.

529 *Mexican Literature.* Representative writers and literary movements of Mexico since 1810 to the present. Credit, 3 hours.

530 *History of the Spanish Language.* Linguistic development of the Spanish language from the epoch of Vulgar Latin to the present day. Credit, 3 hours.

531 *Medieval Spanish Literature.* Representative works from 11th to 16th century. Credit, 3 hours.

534 *Non-Fictional Prose of the Siglo de Oro.* The critical, historical, scientific and philosophical writings of the 16th and 17th centuries. Credit, 3 hours.

539 *The Argentine Novel.* The leading novelists of the 19th and 20th centuries. Credit, 3 hours.

591 *Seminar.* Topics will be selected from the following:

- (a) *The Contemporary Novel.* Credit, 3 hours.
- (b) *Spanish Poetry.* Credit, 3 hours.
- (c) *The Romancero.* Credit, 3 hours.
- (d) *The Latin American Novel.* Credit, 3 hours.
- (e) *Eighteenth Century Thought.* Credit, 3 hours.
- (f) *Latin American Poetry.* Credit, 3 hours.

GEOGRAPHY

PROFESSORS Haring (Agric. 282), Renner, Thomas; ASSISTANT PROFESSORS Frost, Hill, Jordan, Mitchell

DEPARTMENTAL MAJOR REQUIREMENTS—

BACHELOR OF ARTS DEGREE CURRICULUM

GEOGRAPHY—consists of 45 semester hours of credit, of which 24 to 30 semester hours must be in geography, and the remainder of the 45 total hours in a related field. At least 18 semester hours must be in upper division courses.

BACHELOR OF SCIENCE DEGREE CURRICULUM

GEOGRAPHY—consists of 45 semester hours of credit, of which a minimum of 24 semester hours must be in geography. Courses in closely related fields of study which strengthen the field of specialization may be selected in consultation with the adviser. At least 18 semester hours must be in upper division courses.

DEPARTMENTAL MAJOR TEACHING FIELD REQUIREMENTS—

BACHELOR OF ARTS IN EDUCATION DEGREE CURRICULUM

GEOGRAPHY—consists of 45 semester hours of credit, of which 24 must be in geography and 18 in a related teaching field. Courses GE 111 or 411, 112, and 480 are required.

DEPARTMENTAL GRADUATE PROGRAMS—

The Department of Geography offers programs leading to the degree of Master of Arts. Consult the Graduate Catalog for requirements.

GEOGRAPHY

GE 111 *Elements of Geography.* Climate, relief, drainage, soils, plant and animal life; their inter-relationship and influence upon man. Three lectures, 3 hours laboratory. Credit, 4 hours.

112 *World Geography.* The major regions of the world with emphasis on how man has utilized the earth's resources. Credit, 4 hours.

151 *Meteorology.* Weather elements, meteorological instruments, weather maps, forecasting and their relation to activities of man. Credit, 3 hours.

211 *Elementary Cartography and Graphics.* Tools of map-making, map construction, and graphic techniques. Prerequisite: GE 111. One lecture, 3 hours laboratory. Credit, 2 hours.

212 *Geography of Landforms.* Development and interpretation of the relief features of the earth. Prerequisite: GE 111. Credit, 2 hours.

242 *Aerial Photograph Interpretation.* Geographic, physiographic, and military interpretation of aerial photographs. Application to topographic charts and to cartography. Prerequisite: GE 111. One lecture, 3 hours laboratory. Credit, 2 hours.

301 *Geography of Arizona.* Landscape features, climate, soils, minerals, water resources, plant and animal life, and industries, and their influence on man's activities. Credit, 2 hours.

302 *Geography of Anglo-America.* Physiographic provinces of the

continent with their respective climates, products, and major activities of man. Credit, 3 hours.

303 *Geography of South America.* Physiographic regions, their climates, products, and human activities. Credit, 3 hours.

304 *Geography of Middle America.* The lands and peoples of the islands of the Caribbean, Central America, and Mexico. Credit, 2 hours.

311 *Conservation of Natural Resources.* The nature and distribution of natural resources and the problems and principles associated with their use. Credit, 3 hours.

321 *Geography of Europe.* Natural regions of Europe, their climates, relief features, drainage, soils, plants, and animals and their influence upon man's activities. Credit, 3 hours.

322 *Geography of Asia.* Physical and cultural geography of Asia exclusive of the Soviet Union. A geographic interpretation of southern, eastern, and southwestern Asia. Credit, 3 hours.

323 *Geography of Africa.* Geographic study of the continent with emphasis on current political and economic developments. Credit, 3 hours.

324 *Geography of the Soviet Union.* People, space, resources, and power potential of the U.S.S.R. Credit, 3 hours.

331 *Economic Geography.* Production, distribution, and consumption of various types of commodities of the world and relationships to the activities of man. Credit, 3 hours.

341 *Cartography.* Topographic drafting and interpretation of aerial surveys. Introduction to cadastrals and land utilization surveys. Prerequisite: GE 211. One lecture, 3 hours laboratory. Credit, 2 hours.

351 *Climatology.* Principles of climate; attention to climatic regions and climate cycles. Prerequisites: GE 111, 151. Credit, 3 hours.

360 *Urban Geography.* Distribution, internal structure and functions of urban developments with emphasis on the locational features of social, economic and cultural phenomena. Credit, 3 hours.

411g *Physical Geography.* Basic introduction to physiography and the physical elements of the environment. Open only to students who have not taken GE 111. Credit, 3 hours.

412g *Oceanography.* Marine relief, topography, water masses, currents, isohalines, isotherms, biotic environment, marine geochemistry, marine sedimentation as factors in the geography of the oceans. Prerequisites: GE 111; CH 111 or PH 101 or equivalent. Credit, 3 hours.

413g *Geographic Literature.* Current publications in geography; authors, trends of research, and sources. Prerequisite: Approval of instructor. Credit, 2 hours.

418g *Geographic Influences on National Development.* Natural environment as it influences national growth; location, landforms, water-bodies, fuels, ores, forests, grasslands, and deserts. A background for appreciation of differences in national attitudes. Recommended for Social Studies teachers. Credit, 3 hours.

419g *Field Studies in Geography.* Systematic cataloging, mapping and analysis of geographic phenomena by means of actual field work. Written report required. Prerequisite: Approval of instructor. Credit, 3 hours.

422g *Geopolitics.* Examination of the principles of political geography and their application to the major political states of the earth. Credit, 3 hours.

424g *Topics in Geography.* Special topics in physical, economic, social, historical, and political geography. Open to students qualified to pursue independent studies. Prerequisite: Approval of instructor. Credit, 1-3 hours.

433g *Geography of Trade and Transportation.* Geographic analysis of the world's trade routes by land, sea, and air. Prerequisite: GE 111 or 331. Credit, 3 hours.

480g *Methods of Teaching Geography.* Methods of organization and presentation of appropriate content in geography. Prerequisites: 2-SE 311 or concurrently, and 18 hours of geography or approval of instructor. Credit, 3 hours.

GEOLOGY

PROFESSORS Pewe (Agric. 132), Miller; ASSISTANT PROFESSORS Buseck, Lundin, Moore, Warner

DEPARTMENTAL MAJOR REQUIREMENTS—

BACHELOR OF ARTS DEGREE CURRICULUM

GEOLOGY—consists of 45 semester hours of credit, of which 30 hours must be in geology, and 15 hours in closely related fields. Courses GL 111 or 113, 114, 246, 321, 322, 335, 336, 422 or their equivalents are required. The additional courses necessary to complete the major will be approved by the student's adviser. A minimum of 18 semester hours must be in upper division courses.

BACHELOR OF SCIENCE DEGREE CURRICULUM

GEOLOGY—consists of 45 semester hours. The following general basic courses, or their equivalents, are required: GL 111 or 113, 114, 246, 319, 321, 322, 335, 336, 422, 450, 451. To complete the major, more specialized courses in geology or courses in related fields will be approved by the student's adviser. A minimum of 18 semester hours must be in upper division courses. Supporting courses in related fields are CH 113, 115; PH 111, 112; MA 120, 121. Students planning graduate study are urged to take German, Russian or French.

DEPARTMENTAL MAJOR TEACHING FIELD REQUIREMENTS—

BACHELOR OF ARTS IN EDUCATION DEGREE CURRICULUM

GEOLOGY—consists of 45 semester hours of credit. The following courses in geology or their equivalents are required: GL 111 or 113, 114, 126, 246, 321, 322, 335, 336, 450, 480. The student, in consultation with the adviser, will select a minimum of 14 additional semester hours from other geology courses or from a related field or fields.

DEPARTMENTAL GRADUATE PROGRAMS—

The Department of Geology offers programs leading to the degree of Master of Science. Consult the Graduate Catalog for requirements.

GEOLOGY

GL 111 *General Geology.* Physical and historical geology with applications to everyday life. Field trips. Credit, 4 hours.

113 *Physical Geology.* Fundamental physical aspects of the Earth; its minerals and rocks, structures, landscape, and their origins. GL 111 and GL 113 may not both be taken for credit. Three lectures, 3 hours laboratory, field trips. Credit, 4 hours.

114 *Historical Geology.* Chronologic history of the Earth and its inhabitants. Three lectures, 3 hours laboratory, field trips. Credit, 4 hours.

126 *Rocks and Minerals.* Origin, occurrence, classification, and identification of rocks and minerals. Primarily for non-geology majors. One lecture, 3 hours laboratory. Credit, 2 hours.

213 *Geomorphology.* Development and classification of landforms; a detailed analysis of the effect of geologic structure on the landforms developed during the normal cycle of erosion. Prerequisites: GL 113, 114. Two lectures, 3 hours laboratory. Credit, 3 hours.

215 *Geologic Maps.* Structural, stratigraphic, and historical interpretation of geologic maps and cross-sections. Prerequisite: GL 114. One lecture, 3 hours laboratory. Credit, 2 hours.

246 *Structural Geology.* Rock structures, the principles and mechanics of their formation, and their relation to surface features and mineral deposits. Prerequisite: GL 113. Two lectures, 3 hours laboratory, field trips. Credit, 3 hours.

311 *Geology for Engineers.* Physical geology with special emphasis on structural geology, ground water, soil genesis, and relation of geology to engineering problems. Laboratory exercises include rock and mineral identification, and interpretation of geological and topographic maps. Prerequisites: CH 114; 4-CE 241. Two lectures, 3 hours laboratory. Credit, 3 hours.

319 *Field Geology.* Field techniques, including description and measurement of stratigraphic sections, solution of geologic problems, aerial mapping, and plane table surveying. Held on Saturdays in central Arizona. Prerequisite: GL 246 or approval of instructor. Credit, 3 hours.

321, 322 *Mineralogy.* Crystallography, crystal chemistry, and descriptive mineralogy; use of physical and chemical properties in identification of minerals. Field trips. Prerequisites: GL 113; MA 118; CH 115 or concurrently. Two lectures, 3 hours laboratory. Credit, 3 hours each semester.

335, 336 *Invertebrate Paleontology.* The structure and evolutionary development of fossil invertebrates with emphasis on morphology of skeletal parts and the application of paleontology to stratigraphic problems. Field trips. Prerequisite: GL 114. Two lectures, 3 hours laboratory. Credit, 3 hours each semester.

422g *Petrology.* Theoretical and laboratory study of the classification and origin of igneous, sedimentary and metamorphic rocks. Prerequisite: GL 321. Two lectures, 3 hours laboratory. Credit, 3 hours.

423g *Petrography.* Thin section analysis of sedimentary, igneous and metamorphic minerals and rocks. Prerequisite: GL 322. Two lectures, 3 hours laboratory. Credit, 3 hours.

436g *Micropaleontology.* Classification, morphology, and paleoecology of microscopic organisms. Prerequisites: GL 335, 336. Two lectures, 3 hours laboratory. Credit, 3 hours.

450g *Sedimentology.* Origin, transportation, deposition, and methods of statistical analysis applied to problems of ancient and modern sediments. Prerequisite: GL 114. Two lectures, 3 hours laboratory. Credit, 3 hours.

451g *Stratigraphy.* Sources of sediments, depositional environments, and the principles involved in delimiting, correlating, and naming of stratigraphic units. Field trips. Prerequisites: GL 114, 450. Credit, 3 hours.

453g *Quantitative Sedimentation.* Theory and application of various laboratory techniques in the study of sediments. Prerequisite: GL 450. Two lectures, 3 hours laboratory. Credit, 3 hours.

460g *Topics in Geology.* Special topics in petrology, optical mineralogy, economic geology, petroleum geology, regional geology, and sedimentology are open to students qualified to pursue independent studies. Prerequisite: Approval of instructor. Credit, 1-3 hours.

461g *Economic Geology.* Occurrence, distribution, classification, structure, and mineralogy of ore deposits; study of the geologic processes and mode of formation. Prerequisite: GL 321. Field trips. Credit, 3 hours.

465g *Geophysics.* Physics of the earth, geomagnetism, gravity, seismology structure of the earth, origin of continents, atmospheric phenomena. Prerequisites: PH 112; GL 114. Credit, 2 hours.

468g *Ground Water Geology.* Principles governing the occurrence, movement, quality, and recovery of underground water with special reference to Arizona. Prerequisite: GL 450. Credit, 3 hours.

472g *Sedimentary Petrography.* Lithological and mineralogical analysis of sediments and sedimentary rocks by mechanical separations, thin sections, and detrital grains. Prerequisites: GL 321, 322. One lecture, 6 hours laboratory. Credit, 3 hours.

480g *Methods of Teaching Geology.* The collection, identification, preparation, and use of rocks, minerals and other essential materials. Prerequisite: Approval of instructor. Credit, 3 hours.

481g *Geochemistry.* Occurrence of elements and isotopes in the earth and principles governing their distribution. Prerequisite: Approval of instructor. Credit, 3 hours.

483g *Earth Science.* Our earth, its origin, composition, evolution and place in the celestial universe. Credit, 3 hours.

485g, 486g *Earth Science for In-Service Teachers.* An integrated approach to the concepts and principles of earth science. Prerequisite: Approval of instructor. Credit, 3 hours each semester.

534 *Advanced Paleontology.* Ecology, stratigraphic distribution, and evolutionary trends of fossil invertebrates; special reference to concepts in biostratigraphy. Prerequisite: GL 336 or equivalent. Field trips. Two lectures, 3 hours laboratory. Credit, 3 hours.

561 *Metalliferous Economic Deposits.* Field and laboratory study of selected mining districts. Samples of ores and associated rocks collected in the field will be studied by various techniques in the laboratory to determine type and genesis of mineralization. Prerequisite: Approval of instructor. One lecture, 6 hours laboratory, field trips. Credit, 3 hours.

580 *Laboratory Techniques in Geochemistry.* Introductory training in the use of tools and techniques used in geochemical research. Experiments of geochemical interest are done using the emission spectrograph, spectrophotometer, X-ray spectrometer, mass spectrometer, and radioactivity counters. Sample selection and preparation and wet chemistry are considered. Prerequisite: Approval of instructor. Credit, 3 hours.

591 *Seminar.* Topics will be selected from the following:

- (a) *Igneous, Metamorphic and Sedimentary Petrology.* Credit, 2-3 hours.
- (b) *Seismology and Applied Geophysics.* Credit, 2-3 hours.
- (c) *Geotectonics.* Credit, 2-3 hours.
- (d) *Paleoecology.* Credit, 2-3 hours.
- (e) *Paleozoic, Mesozoic and Cenozoic Stratigraphy.* Credit, 2-3 hours.
- (f) *Mineralogy and Crystallography.* Credit, 2-3 hours.
- (g) *Industrial Minerals.* Credit, 2-3 hours.
- (h) *Earth Science for In-Service Teachers.* Credit, 2-3 hours.

See related courses: CH 581 *Isotope Geochemistry;* CH 582 *Topics in Geochemistry and Cosmochemistry;* BO 490 *Paleobotany.*

HEALTH, PHYSICAL EDUCATION, AND RECREATION

PROFESSORS Gillanders, Murphy, Stewart, Thomson, Wegner;
ASSOCIATE PROFESSORS Smith (MPE 201), Bryant, Dickinson,
Gisolo, Kajikawa, Klann, Pittman, Steverson; ASSISTANT
PROFESSORS Grier, Kentner, Kush, Packer, Penman,
Pike, Plummer, A. Smith, Wulk; INSTRUCTORS
Bredehoft, Castillo, Corrick, Hardwick, Kemp,
Mann, Stovall, Tamburo, Winkles

DEPARTMENTAL MAJOR REQUIREMENTS—

BACHELOR OF SCIENCE DEGREE CURRICULUM

HEALTH EDUCATION — consists of 45 semester hours of credit. Courses HE 100, 360, 461, 480, 481; MI 201, ZO 201, 202 are required. An additional 20 hours are to be selected from related fields by the student in consultation with the adviser. At least 18 semester hours must be in upper division courses.

PHYSICAL EDUCATION—consists of 45 semester hours of credit of which 30 must be in the major subject field and 15 in closely related fields to be approved by the adviser in consultation with the student. Courses PE 150, 151, 161, 250, 251, 385, and 472 are required. At least 18 semester hours must be in upper division courses.

Special programs with emphases in Occupational Therapy and Physical Therapy are available. Graduation is with the degree of Physical Education.

RECREATION—consists of 45 semester hours of credit of which 24 must be in recreation and 21 in closely related fields to be approved by the adviser in consultation with the student. Courses RE 150, 260, 261, 262, 370, 371, 372, 470, and 2 semester hours of physical education activity courses are required. At least 18 semester hours must be in upper division courses.

BOYS' CLUB ADMINISTRATION—consists of 45 semester hours of related fields to be approved by the adviser in consultation with the student. credit of which 35 must be in the major subject field and 10 in closely Courses PY 112, 350; SE 100; RE 150, 262, 372; PE 430, 471, 472, and the six hour Boys' Club course at New York University during the senior year are required. At least 18 semester hours must be in upper division courses.

DEPARTMENTAL MAJOR TEACHING FIELD REQUIREMENTS—

BACHELOR OF ARTS IN EDUCATION DEGREE CURRICULUM

HEALTH EDUCATION — consists of 45 semester hours of credit. Courses HE 100, 360, 461, 481; MI 201; ZO 201, 202 are required. An additional 20 hours are to be selected from related fields by the student in consultation with the adviser. At least 18 semester hours must be in upper division courses.

PHYSICAL EDUCATION—consists of 45 semester hours of credit of which the following are required: PE 150, 151, 161, 250, 251, 366, 385, 400, 472, 480, and one semester hour in activity courses. At least 18 semester hours must be in upper division courses. The entire program must be planned in consultation with the student's adviser.

DEPARTMENTAL GRADUATE PROGRAMS—

The Department of Health, Physical Education and Recreation offers programs leading to the degree of Master of Science. Consult the Graduate Catalog for requirements.

HEALTH EDUCATION

HE 100 *Healthful Living.* Knowledge, attitudes, and practices which promote and maintain personal and community health. Credit, 3 hours.

360 *School-Community Health.* The basic plan of the school health program — health services, health instruction, and healthful school environment. The role of the teacher in relation to the school health program and the community health program. Credit, 3 hours.

461g *School Health Problems.* Community and school health problems. Designed to develop skills in the analysis and solution of selected problems. Includes organization and operation of school and community health councils. Prerequisite: HE 360 or teaching experience. Credit, 3 hours.

480g *Methods of Teaching Health.* Analysis of the techniques and materials for health instruction. Credit, 3 hours.

481g *Principles and Practices of Public Health.* The major areas of public health and the principles involved in the operation of an adequate community health program. Particular stress is directed to the public health programs of Arizona. Afternoon and evening field trips may be scheduled. Credit, 3 hours.

560 *Curriculum Construction in Health Education.* The problems of curriculum construction with respect to acquisition of materials, the establishment of basic curriculum philosophies, the application of educational principles, and the sequence of course content. Credit, 2 hours.

562 *Evaluation in Health Education.* Techniques and devices for evaluating school health programs. Credit, 2 hours.

563 *Administration of School Health Programs.* Principles and techniques for coordinating and administering school health programs; personnel, legal aspects, public relations, policies, health service, and instruction. Meets teacher certification requirement. Prerequisite: HE 360 or teaching experience. Credit, 3 hours.

PHYSICAL EDUCATION

PE 101 *Freshman Physical Education.* Required of all freshman men students not specializing in physical education. Students registered for basic ROTC or AFROTC attend one hour a week; all others attend twice a week. May be repeated for credit. Credit, ½ hour.

102 *Freshman Physical Education.* Required of all freshman women students not specializing in physical education. Twice a week. May be repeated for credit. Credit, ½ hour.

103 *Adapted Activities.* Limited activities for students who cannot, because of disabilities, enroll in regular physical education classes. Written recommendation of the school physician required. Twice a week. May be repeated for credit. Credit, ½ hour.

110, 111 *Team Sports.* Skills, strategy, rules interpretation, and techniques of officiating the major team sports for women. Opportunity to qualify for Intramural, Associate, Local, and National ratings in the appropriate sports. Meets two hours weekly. Credit, 1 hour each semester.

120, 121 *Individual and Dual Sports.* Instruction in golf, tennis, badminton, archery, fencing, wrestling, gymnastics, and other individual and dual sports. Twice a week. Credit, ½ hour each semester.

130, 131 *Dance.* Classes in tap, square, folk, social and modern dance and other dance activities are offered. Twice a week. Credit, ½ hour each semester.

140, 141 *Aquatics.* Swimming, diving and other aquatic activities. Twice a week. Credit, ½ hour each semester.

PE 150, 151 *Professional Activities.* Skills in physical education activities for physical education majors and minors. Three activities may be taken each semester; each activity section of five weeks duration, six hours each week. Credit, 1 hour per section each semester.

161 *Introduction to Physical Education.* Orientation to the field of physical education. Required of all freshmen specializing in physical education. Credit, 2 hours.

162 *Occupational and Physical Therapy.* Backgrounds, purposes and functions of the professions of physical therapy and occupational therapy; their relationships to health professions and community agencies. Credit, 2 hours.

210, 211 *Team Sports.* Continuation of PE 111. Twice a week. Credit, 1 hour each semester.

220, 221 *Individual and Dual Sports.* Continuation of PE 121. Twice a week. Credit, ½ hour each semester.

230, 231 *Dance.* Continuation of PE 131. Twice a week. Credit, ½ hour each semester.

240, 241 *Aquatics.* Continuation of PE 141. Twice a week. Credit, ½ hour each semester.

250, 251 *Professional Activities.* Skills in physical education activities for physical education majors and minors. Three activities may be taken each semester; each activity section of five weeks duration, six hours each week. Credit, 1 hour per section each semester.

260 *First Aid Instructorship.* For individuals who wish to receive certification as Red Cross First Aid Instructors. Prerequisite: Must be 18 years of age and hold current advanced certificate. Credit, 1 hour.

261 *Dance Composition.* Study and analysis of theme and dramatic ideas

drawn from poetry, drama, music, and other art forms for use in dance composition. Prerequisite: Approval of instructor. One lecture, 2 hours laboratory. Credit, 2 hours.

262 *Dance Production.* Theory of, and experience in, the staging of dance programs, including lighting, costuming, scenery, and make-up. One lecture, 2 hours laboratory. Credit, 2 hours.

280 *History and Philosophy of Dance.* Dance from ancient times to the present. Consideration of dance as an art in relation to other arts; primitive, pre-classic, and modern forms. Credit, 2 hours.

287 *Physical Education for the Adapted Student.* A study of handicapping conditions found among students. Adaptation of exercises and activities to individual needs. Open to all students. Credit, 2 hours.

320, 321 *Individual and Dual Sports.* Continuation of PE 221. Twice a week. Credit, ½ hour each semester.

330, 331 *Dance.* Continuation of PE 231. May be repeated for credit. Twice a week. Credit, ½ hour each semester.

340, 341 *Aquatics.* Advanced skills such as Red Cross Senior Life Saving, Red Cross Water Safety Instructorship (Prerequisite: Current Senior Red Cross Life Saving certificate), synchronized swimming, and other aquatic activities. Twice a week. Credit, ½ hour each semester.

360, 361 *Theory and Practice of Teaching Dance.* Theory and practice in the teaching of creative, folk, square, social, modern, and other dance forms. Analysis and acquisition of materials suitable for school and recreational use. Separate sections offered for the various emphases. One lecture, 2 hours laboratory. Credit, 2 hours.

362 *Officiating Football, Basketball, Baseball and Track.* Rules and the mechanics of officiating used in football, basketball, baseball, and track. Credit, 3 hours.

364 *Methods of Coaching.* Theory and techniques of coaching competitive sports; includes baseball, gymnastics, swimming, track and field, wrestling and other sports. Each sport presented for one-half semester. Meets four hours each week. Prerequisite: Professional Activity course for applicable sport. Credit, 1 hour.

365 *Methods of Coaching.* Theory and techniques of coaching competitive basketball and football. Each sport meets four hours per week for one semester. Credit, 2 hours.

366 *Physical Education for the Elementary School.* The scope and values of physical education and movement education in the elementary school. Methods, materials, and practice in teaching activities for primary, intermediate and upper grades. Separate sections for prospective classroom teachers and physical education majors and minors. Credit, 3 hours.

368 *Theory and Practice of Teaching Sports.* Theory and practice in teaching and coaching in the areas of aquatics, team sports, individual and dual sports. Analysis of motor skills and acquisition of suitable materials for all school levels. Credit, 3 hours.

370 *Varsity Athletics.* Credit may be given for participation in varsity sports. For men and women. May be repeated for credit. Time arranged. Credit, ½ hour.

385 *Kinesiology.* Analytic and synthetic studies of body movements.

Neuromuscular skills and body mechanics are emphasized. Prerequisites: ZO 201, 202. Credit, 3 hours.

386 *Physiology of Exercise.* The effects of the various types of exercises upon body structure and function. Prerequisites: ZO 201, 202. Credit, 3 hours.

387 *Application of Scientific Principles to Athletics.* Analysis and application of scientific principles of anatomy, chemistry, physics, physiology, and other applied sciences to sport skills in athletics. Credit, 3 hours.

400 *Tests and Measurements in Physical Education.* Analysis and construction of tests, analysis of data, and interpretation of measurement in physical education programs. Credit, 2 hours.

430 *Boys' Club Field Experience.* The student is assigned to a cooperating Boys' Club for a period of 12 weeks, 30 hours a week. To be taken during the fall semester of the senior year. Open only to majors in this program. Credit, 8 hours.

462 *Techniques of Athletic Training.* Emphasizes the correct use of personal and field equipment, support procedures and therapeutic aids. Laboratory work includes practical techniques in the clinical use of supporting apparatus, physical therapy. Prerequisites: ZO 201, 202, or PE 387. Credit, 2 hours.

463g *Advanced Dance Composition.* The investigation and practice of archaic, preclassic, and contemporary styles of choreography. Prerequisite: PE 261 or approval of instructor. Credit, 3 hours.

464g *Dance Accompaniment.* Analysis of the function of accompaniment for dance; experience in the use of percussion, voice, records, piano, and selected instruments in relation to their use in composition. Credit, 2 hours.

465g *Modern Practices in Physical Education.* Current practices, materials, and trends of physical education activities and their function in contemporary physical education programs are analyzed and experienced. Credit, 3 hours.

470g *Adapted Physical Education.* The organization, administration and content of adapted physical education programs including an examination of the principles of body mechanics and their application to exercise and to adapted physical education activities, experience in related screening tests, and the preventative rather than the corrective aspects of postural improvement. Prerequisites: PE 385, 386. Credit, 3 hours.

471g *Organization and Administration of Intramural Activities.* Principles and practices of the organization of intramural programs. Credit, 2 hours.

472 *Organization and Administration of Physical Education.* Organization and administration of school physical education programs. Curricula, staff, facilities, budget, scheduling, and equipment analyzed. Credit, 3 hours.

480g *Methods of Teaching Physical Education.* Methods of instruction, organization, and presentation of appropriate content in physical education. Credit, 3 hours.

560 *Curriculum Construction in Physical Education.* Application of the principles, practices, and functional philosophies of curriculum making in physical education. Prerequisite: Major in physical education or teaching experience. Credit, 3 hours.

563 *Planning Facilities in Health, Physical Education and Recreation.*

Standards and principles for coordinated planning in the construction, multiple use, and maintenance of facilities involving outdoor play areas, athletic fields, gymnasiums, swimming pools, camps, school health centers, and other special areas. Credit, 2 hours.

564 *Improving Performance in Competitive Athletics.* Factors that make for successful motor performance in skills used in individual, dual, and team sports. Ballistic movement, balance, kinesthesis, resistive exercises, spaced activity, laws of learning, physics, kinesiology, and physiology of exercise are investigated and analyzed. Credit, 3 hours.

565 *Evaluation in Physical Education.* The need and importance of evaluation in physical education activities. Skill tests, knowledge tests, attitude tests, motor capacity tests, and classification tests are studied, and opportunity for practical experience in administering the several types of tests is provided. Credit, 3 hours.

570 *Organization and Administration of Athletics.* Practical suggestions and guides for managing the affairs of an athletic program. Financing, budget policies, staging and promotion of athletic contests, schedules, travel, insurance, and current athletic trends are considered. Credit, 3 hours.

571 *Supervision of School Health and Physical Education.* Contemporary trends and practices in the supervision of health and physical education with special emphasis on supervision of teachers, in-service training, public relations and policies related to promotions. Credit, 2 hours.

580 *History and Philosophy of Physical Education.* The historical development of the philosophies of physical education and the assumptions on which current professional philosophies rest. Credit, 3 hours.

585 *Synthesis of Body Movement.* Basic movement common to all physical education activities combined with derivations peculiar to special forms of movement, with opportunity to investigate and experience movement in relation to space, time, dynamics, kinesthetic cognition and purpose. Credit, 3 hours.

RECREATION

RE 120 *Recreational Games.* Instruction and playing experience in table tennis, shuffleboard, bowling, paddle tennis, deck tennis, croquet. Twice a week. Credit, ½ hour.

150 *Camp Activities and Skills.* Camp counseling involving outdoor cookery, nature study, nature crafts, camp crafts, story telling, dramatics, songs and music, overnight trips, shelters, orienting, axmanship, firecraft, food preservation and cooking devices. Credit, 3 hours.

260 *Community Recreation.* Orientation to the field of organized recreation in terms of its history, philosophy, and development, and the contribution of organized recreation to the school and community. Credit, 2 hours.

261 *Social Recreation.* The development of methods and materials for leadership in social recreational activities for school, church, home, club, and other social groups. Credit, 2 hours.

262 *Program Planning and Recreational Leadership.* Principles and practices involved in planning and carrying out programs of recreation for playgrounds, community centers and youth-serving organizations. Acquisition of methods, materials and leadership skills and techniques through laboratory practice. Credit, 3 hours.

363 *Directed Field Experience in Recreation.* Supervised leadership assignments, or experience equivalent, in public or private agency, camp or institution with emphasis on a variety of leadership experiences common to such organizational programs. May be repeated for credit up to six hours. Credit, 2 hours.

370 *Public School Camping and Program Planning.* Materials, procedures, and plans for a school camp program and the relationship of camping to other areas of education. Credit, 3 hours.

371 *Organization and Administration of Recreation.* The administrative structure and organizational policies and practices on the local, state, and national level. Analysis of methods of operation, finance, personnel standards and problems, legal aspects and study of modern trends in terms of present and projected future community needs. Credit, 3 hours.

372 *Youth Organizations.* Principles, practices and leadership experience of national youth-serving organizations. Credit, 3 hours.

470g *Camp Organization and Administration.* Organization and administration of camps with special emphasis on school camps; preparation for camp management; consideration of budget, camp site, and personnel. Credit, 2 hours.

HISTORY

PROFESSORS Hubbard (SS 225G), Dannenfeldt, Krenkel, Krout, Sacks, Tilden; ASSOCIATE PROFESSORS Adams, Barlow, Dudley, Martinez, Young; ASSISTANT PROFESSORS DeJong, Kleinfeld, Paulsen, Phillips, Smith, Wootten

DEPARTMENTAL MAJOR REQUIREMENTS— BACHELOR OF ARTS DEGREE CURRICULUM

HISTORY—consists of 45 semester hours of credit of which 30 must be in history and 15 in closely related fields to be approved by the adviser in consultation with the student. Courses HI 101, 102, 103, and 104 are required. An additional 18 hours in history courses will be approved by the adviser in consultation with the student. At least 12 hours in history and 6 hours in the related fields must be in upper division courses.

DEPARTMENTAL MAJOR TEACHING FIELD REQUIREMENTS— BACHELOR OF ARTS IN EDUCATION DEGREE CURRICULUM

HISTORY—consists of 45 semester hours of credit. Courses HI 101, 102, 103, and 104 are required. An additional 33 hours, at least 18 of which must be in history, will be approved by the adviser in consultation with the student. The remaining courses to complete the major may be in history or closely related fields. At least 18 hours must be in upper division courses.

DEPARTMENTAL GRADUATE PROGRAMS—

The Department of History offers programs leading to the degree of Master of Arts. Consult the Graduate Catalog for requirements.

HISTORY

HI 101, 102 *Western Civilization.* The first semester traces western civilization from its origins through the seventeenth century; the second semester continues the survey to modern times. Credit, 3 hours each semester.

103, 104 *History of the United States.* The growth of the Republic from colonial times, with the first semester covering through the Civil War period and the second continuing to the present day. Credit, 3 hours each semester.

241, 242 *History of Latin America.* First semester, ancient civilization, explorers and conquerers, and colonial institutions; second semester, the nationalistic development of the independent republics since 1825. Credit, 3 hours each semester.

301, 302 *Ancient Near East and the Classical World.* First semester, the history and civilization of the Ancient Orient and Greece; the second semester, classical history to the downfall of the Roman Empire. Credit, 3 hours each semester.

303, 304 *American Cultural History.* Culture in a broad connotation including ideas, ideals, the arts, and social and economic standards. First semester, the nation's colonial background and early national period; second semester, the age of industrialism and modern America. Credit, 3 hours each semester.

305, 306 *Eastern Civilizations.* The features, developments, and extensions of the civilizations of the Middle East, India, and the Far East analyzed to provide an understanding of this area of growing importance in the world today. First semester, to mid-nineteenth century; second semester, since mid-nineteenth century. Credit, 3 hours each semester.

321, 322 *The Middle Ages.* The political, socio-economic, and cultural development of Western Europe. First semester, Early Middle Ages; second semester, High Middle Ages. Prerequisite: HI 101 or approval of instructor. Credit, 3 hours each semester.

323, 324 *Intellectual History of Modern Europe.* The major political, social, and economic trends in European thought from the Enlightenment to the present. First semester, Enlightenment to mid-19th century; second semester, Marxism to the present. Prerequisite: HI 102 or approval of instructor. Credit, 3 hours each semester.

325 *Diplomatic History of Modern Europe.* European diplomatic history from the Peace of Utrecht (1713) to the present. Credit, 3 hours.

331 *American Colonial History.* Political, economic, social, and cultural history of the colonial era. Concentrates primarily on English with some consideration of Spanish, French, and other colonies. Credit, 3 hours.

336 *Recent American History.* The important developments in American history since 1914. Prerequisite: HI 104. Credit, 3 hours.

337, 338 *The West in American History.* First semester, the Turner Thesis of the significance of the frontier in American history, beginning with discovery and exploration, and continuing to the period of Texas and the Mexican War; second semester, the development of the frontier thesis to 1890, with emphasis upon Arizona and the Southwest. Prerequisites: HI 103, 104 or approval of instructor. Credit, 3 hours each semester.

341 *History of Mexico.* The formation, culture and social life of the Mexican people since colonial times. A knowledge of Spanish is desirable but not essential. Credit, 3 hours.

351, 352 *History of England.* The political, economic and social development of the English people. First semester, from the earliest times to the 17th century; second semester, from the 17th century to the present. Credit, 3 hours each semester.

354 *British Constitutional History.* The historical development of the constitutional system of Great Britain from the Middle Ages to the present with particular emphasis on the growth of democracy. Prerequisites: HI 101, 102 or 351, 352 or approval of instructor. Credit, 3 hours.

421g *The French Revolution and the Napoleonic Era.* Conditions in France before 1789, the Revolution from 1789 to 1799, the organization of France under Napoleon, and the impact of changes in France on European society. Prerequisite: Six hours of history or approval of instructor. Credit, 3 hours.

423g *Renaissance and Reformation.* Antecedents and development of the Renaissance in Italy, its spread into the rest of Europe, and the subsequent changes in religious and political thought. Prerequisite: HI 101 or approval of instructor. Credit, 3 hours.

424g *Age of Absolutism.* Political, social, economic and cultural changes in Europe from the Peace of Westphalia to the eve of the French Revolution. Prerequisite: HI 102 or approval of instructor. Credit, 3 hours.

425g, 426g *Europe in the 19th Century.* Political, social, economic, and intellectual currents in Europe from Napoleon through World War I. First semester, 1815-1866; second semester, 1866-1918. Prerequisite: Six hours of history or approval of instructor. Credit, 3 hours each semester.

427g *Modern France.* France since 1870. Prerequisite: HI 102 or approval of instructor. Credit, 3 hours.

428g *Modern Germany.* The development and expansion of Germany from 1848 to the present. Emphasis on political, social, and intellectual trends and problems. Prerequisite: HI 102 or approval of instructor. Credit, 3 hours.

429g *Contemporary Europe.* Europe in its world setting since World War I. Emphasis on major political issues of the contemporary scene. Prerequisite: HI 102 or 104 or approval of instructor. Credit, 3 hours.

431g, 432g *American Biography.* Considers the noted Americans who made important contributions to United States history. First semester, the period prior to 1860; second semester, since 1860. Prerequisites: First semester, HI 103 or approval of instructor; second semester, HI 104 or approval of instructor. Credit, 3 hours each semester.

433g *American Diplomatic History.* The diplomatic history of the United States from independence to the rise of America as a world power. Prerequisites: HI 103, 104 or approval of instructor. Credit, 3 hours.

434g *Constitutional History of the United States.* The origin and development of the Constitution of the United States with special emphasis on how it has been interpreted by the courts. Prerequisites: HI 103, 104 or approval of instructor. Credit, 3 hours.

436g *Middle Period in American History.* The impact of nationalism, liberalism, and sectionalism upon American life, 1828-1860. Prerequisite: HI 103 or approval of instructor. Credit, 3 hours.

437g *Civil War and Reconstruction.* Analysis of the causes and development of the war, political, constitutional and social issues of reconstruction and their effects on post-war America. Prerequisite: HI 103 or 104 or approval of instructor. Credit, 3 hours.

438g *Populism and Progressivism.* Political trends in the United States, 1877-1918. Prerequisite: HI 104 or approval of instructor. Credit, 3 hours.

439g *Economic History of the United States.* An analysis of economic growth in the United States. Prerequisites: HI 103, 104 or 3-EC 201 or approval of instructor. Credit, 3 hours.

441g *Diplomatic History of Latin America.* The struggle for diplomatic recognition, attempts at political union, and participation in international organizations since 1810. Prerequisite: HI 242 or approval of instructor. Credit, 3 hours.

443g *Contemporary Latin America.* Political, economic, and social events and trends since World War II. Prerequisite: HI 242 or approval of instructor. Credit, 3 hours.

449g *Intellectual and Cultural History of Latin America.* Main currents of thought, the outstanding thinkers and their impact on 19th and 20th century Latin America. The cultural and institutional basis of Latin American life. Credit, 3 hours.

451g *The British Empire and the Commonwealth.* The growth and development of the British Empire, with emphasis on those factors contributing to the transition to the Commonwealth of Nations. Prerequisite: HI 102 or 352 or approval of instructor. Credit, 3 hours.

452g *Tudor and Stuart England.* The political, social, economic, and cultural developments which contributed to the forming of the modern world. Prerequisite: HI 101 or 352 or approval of instructor. Credit, 3 hours.

453g *Modern Britain.* Analysis of the factors contributing to Britain's position as the world's leading power in the 19th century and its decline from that position in the 20th century. Prerequisite: HI 102 or 352 or approval of instructor. Credit, 3 hours.

461g *History of Russia to* 1917. The development of Russian political, economic, social, religious and intellectual institutions and traditions from the 9th century to the Revolution of 1917. Prerequisite: HI 102 or approval of instructor. Credit, 3 hours.

462g *The Soviet Union.* The development of the Soviet system since the Revolution of 1917, with emphasis on its Russian, European, Asian, and global significance. Prerequisite: HI 102 or approval of instructor. Credit, 3 hours.

471g, 472g *The Far East.* History and culture of China and Japan, including the areas of peripheral influence. First semester, to the mid-19th century; second semester, to the present emphasizing the impact of the West on the Far East. Credit, 3 hours each semester.

480g *Methods of Teaching History.* Methods of instruction, organization and presentation of the subject matter of history and closely allied fields. Credit, 3 hours.

481g *History of the Middle East.* Historical development of the area inhabited by the Arab, Turkish, Israeli, and Persian people, emphasizing the cultures and the world strategic significance of the area. Prerequisite: HI 102 or 104 or approval of instructor. Credit, 2 hours.

500 *Research Methods.* Credit, 3 hours.

512 *European Historiography.* The methods and theories of the writers of Ancient and European history. Credit, 3 hours.

513 *American Historiography.* The methods and theories of the writers of United States history. Credit, 3 hours.

591 *Seminar.* Topics will be selected from the following:
- (a) *United States History.* Credit, 3 hours.
- (b) *Arizona History.* Credit, 3 hours.
- (c) *European History.* Credit, 3 hours.
- (d) *British History.* Credit, 3 hours.
- (e) *Latin American History.* Credit, 3 hours.

HOME ECONOMICS

PROFESSORS Bresina (HEc 104), Kagy, Rannells, Smith;
ASSOCIATE PROFESSORS Barkley, Ellsworth, Wright;
ASSISTANT PROFESSORS Bates, Breslin, Hoover,
McInnis, Streufert, Wooldridge

The Department of Home Economics offers curriculums leading to a Bachelor of Arts or a Bachelor of Science degree with a major in home economics with five areas of emphasis: clothing, textiles and related art; family life and child development; foods and nutrition; home economics in business; and general home economics. Students who elect the area of concentration related to business with emphasis in foods and equipment are prepared for employment in the home economics departments of food processors, equipment manufacturers, and public utilities; those in clothing and textiles, for fashion merchandising and consumer service. Both areas prepare students for advertising and publicity agencies, newspapers, and magazines.

DEPARTMENTAL MAJOR REQUIREMENTS—

BACHELOR OF ARTS DEGREE CURRICULUM

HOME ECONOMICS—consists of 45 semester hours of credit of which not more than 30 may be in home economics and at least 15 in related fields to be approved by the adviser in consultation with the student. Courses HO 122, 132, 141, 171, 232, 253, and 254 are required. The remaining courses will be determined by the adviser in consultation with the student, depending on the area of emphasis. At least 20 semester hours of credit must be in upper division courses.

BACHELOR OF SCIENCE DEGREE CURRICULUM

HOME ECONOMICS—consists of 50 semester hours of credit of which at least 20 must be in upper division courses. Courses HO 122, 132, 141, 171, 232, 253, and 254 are required. The remaining courses will be determined by the adviser in consultation with the student, depending on the area of emphasis. At least 20 semester hours of credit must be in upper division courses.

Students who satisfactorily complete the requirements for this degree with emphasis in foods and nutrition can qualify for entrance to training centers in institution management and hospital dietetics as approved by the American Dietetics Association.

DEPARTMENTAL MAJOR TEACHING FIELD REQUIREMENTS—

BACHELOR OF ARTS IN EDUCATION DEGREE CURRICULUM

HOME ECONOMICS—consists of 45 semester hours of credit in home economics. At least 18 semester hours of credit must be in upper division courses. In addition to the home economics core (HO 122, 132, 141, 171, 232, 253, and 254), required courses are HO 123, 142, 222, 321, 331, 341, 354, 431, 457, 480; CH 101 or 111 (chemistry requirement) must be fulfilled during the first two years.

Students enrolled in this major meet requirements for vocational certification and are qualified for work in the Extension Service.

DEPARTMENTAL GRADUATE PROGRAMS—

The Department of Home Economics offers programs leading to the degree of Master of Science. Consult the Graduate Catalog for requirements.

HOME ECONOMICS

HO 122 *Clothing Selection.* Suitability of apparel and accessories (design, color, texture), wise practices in buymanship, and understanding relationship of clothing and appearance to human behavior. Credit, 2 hours.

123 *Clothing Construction.* Principles related to the construction processes of various fabrics and fashions, study and use of commercial patterns. Two lectures, 4 hours laboratory. Credit, 3 hours.

132 *Personal Adjustment for Family Living.* The individual's adjustment to present and future personal and family relations. Designed for majors and non-majors. Open to men and women. Credit, 2 hours.

141 *Elementary Nutrition.* Principles of nutrition, diet, food in its relation to health. Open to men and women. Credit, 2 hours.

142 *Applied Food Principles.* Scientific principles and nutritive facts related to preparation, service and preservation of food. Designed for majors and non-majors. One lecture, 4 hours laboratory. Credit, 3 hours.

171 *Art in the Home.* Appreciation of line, texture, color, space and form, and the understanding of the principles of design as applied to the selection and arrangement of accessories for the home. Credit, 2 hours.

222 *Textiles.* Textile fibers and fabrics, their source, identification, finish, characteristics, performance and uses. Credit, 3 hours.

232 *Child Development.* Human development from birth through the pre-school years to later childhood; emphasis on the uniqueness of each person and the significance of family membership. Guided observations. Credit, 3 hours.

253 *Household Equipment.* The selection, use, care, safety, and arrangement of household equipment. One lecture, 2 hours laboratory. Credit, 2 hours.

254 *Management of Resources.* Management in terms of goals for the individual and the family. Importance of choices in regard to the wise use of time, money, energy, abilities, skills and material goods on the basis of family relations and the optimum development of the individual. Credit, 3 hours.

272 *Home Furnishing.* Selection, combination, and arrangement of furniture, color schemes; choice of wall finishes, floor coverings, draperies, and accessories. Credit, 3 hours.

321 *Pattern Designing.* Fundamental principles in designing, cutting, and fitting individualized garments. Flat patterns used. Prerequisites: HO 122 and 123. Two lectures, 4 hours laboratory. Credit, 3 hours.

331 *Family Relationships.* Understanding of family life and current problems including preparation for marriage. Open to men and women. Credit, 3 hours.

341 *Meal Management.* Nutritional and social aspects of planning, preparing and serving family meals. Time, energy and equipment management; hospitality; food costs; and table appointments. Prerequisite: HO 142. Two lectures, 3 hours laboratory. Credit, 3 hours.

343 *Quantity Cookery.* Standard methods of food preparation in quantity; operation of institutional equipment, menu planning for institutions. Experience in quantity food service. Prerequisite: HO 142. One lecture, 6 hours laboratory. Credit, 3 hours.

352 *Housing.* Family housing as affected by legislation, life cycle, physical and psychological needs, with application to modern housing; kitchen planning. Credit, 3 hours.

354 *Consumer Problems and Family Finance.* The economic problems of the individual and family, with the consideration of wise use of income, the selection and use of consumer goods on different levels, analysis of standards for buying, including comparative costs, and the influence of advertising, retail stores, and government agencies. Credit, 3 hours.

422g *Draping and Dress Design.* Working with fabric on a dress form expressing original ideas in dress design; emphasis upon the understanding of the principles involved in fitting and pattern construction. Prerequisites: HO 122, 123. Two lectures, 4 hours laboratory. Credit, 3 hours.

423g *Tailoring.* Construction of coat or suit; tailoring techniques, alteration of patterns, and fitting emphasized. Prerequisites: HO 123, 321. Two lectures, 4 hours laboratory. Credit, 3 hours.

427g *Clothing the Family.* Selection of appropriate fabric; self-help, comfort and artistic features. Credit, 3 hours.

428g *Clothing and Textile Appraisal.* Problems which affect the consumer in the production, distribution, and consumption of textiles and clothing. Prerequisite: HO 222. Credit, 2 hours.

429g *Research in Textiles and Clothing.* Studies and experiments in performance and care of today's textile fibers, fabrics and finishes in relation to techniques in construction and fashions in custom-made and ready-to-wear apparel. Prerequisites: HO 122, 123. Credit, 3 hours.

431 *Nursery School Education.* Participation in the University nursery school. Discussion and application of methods for guiding children in routines and free-play activities. Prerequisites: HO 232; 2-EE 313 or 1 course in psychology. Two lectures, 3 hours laboratory. Credit, 3 hours.

432g *Behavior of Young Children.* Understanding developmental problems occurring most frequently in early childhood. Survey of recent literature. Prerequisite: HO 232 or 2-EE 313 or 1 course in psychology. Credit, 2 hours.

433g *Enrichment Activities for the Young Child.* Methods of relating art, literature, music, and science activities to interests of the nursery school child. Planning of projects for nursery school groups. Prerequisites: HO 232; 2-EE 313. Credit, 3 hours.

434g *Organization and Administration of Preschools.* Curriculum planning and evaluation of existing and proposed programs in relation to recommended standards and needs of the community. Prerequisite: HO 431 or approval of instructor. Credit, 3 hours.

435g *Advanced Family Relationships.* Inter-personal relationships, role concepts and dynamic processes of adjustment. Prerequisites: HO 232 or 2-EE 313 and HO 331. Credit, 3 hours.

436g *Child Development and Family Living.* Contributions of the home in meeting developmental needs of the infant and young child. Integration of class lectures with individual experiences in selected homes. Prerequisites: HO 232; 2-EE 313; HO 331. Credit, 2 hours.

441g *Advanced Nutrition.* Special problems in diet and nutrition. Prerequisites: HO 141; CH 101. Credit, 3 hours.

442g *Experimental Foods.* Application of experimental methods to preparation of food; reports and reading of food research. Prerequisites: HO 142; CH 101, 102 or equivalent. Six hours a week. Credit, 3 hours.

443g *Child Nutrition.* The nutritional needs from prenatal development through adolescence; food requirements, feeding practices, and indices of good nutritional status. Prerequisites: HO 141, 142, 232, or approval of instructor. Credit, 2 hours.

444g *Diet Therapy.* Methods of adapting, modifying, and applying normal nutrition principles to abnormalities of metabolism. Prerequisites: HO 142, 341, 441, or approval of instructor. Credit, 3 hours.

445g *Institution Food Service.* The organization, administration and management of food service in hospitals and institutions. Prerequisites: HO 142, 343. Credit, 3 hours.

446g *Institution Food Purchasing.* Food purchasing for institutions; understanding of cost factors, food laws, quality standards, and basic manufacturing processes. Prerequisites: HO 142, 343. Credit, 3 hours.

447g *Gourmet Foods.* The art and appreciation of international epicurean foods accompanied by preparation and appropriate service. Prerequisite: HO 142 or approval of instructor. Three hours a week. Credit, 2 hours.

456g *Development in Infancy and Early Childhood.* Developmental characteristics of infant and pre-school child with implication for guidance in home and nursery school. Prerequisite: Approval of instructor. Credit, 3 hours.

457 *Home Management.* A laboratory application of principles of management to the home. Five weeks of residence in Home Management House or a special program for married students. Advance reservation advised. Prerequisites: HO 253, 254. Credit, 2 hours.

461g *Demonstration Techniques.* Principles and techniques of demonstrations. Practical experience before audiences. Prerequisite: HO 142 (341 for food majors). Six hours a week. Credit, 3 hours.

462g *Home Economics in Business.* Organization and scope of home economics departments in business and industrial fields. Credit, 2 hours.

480g *Methods of Teaching Home Economics.* Methods of instruction, organization, and presentation of appropriate content in Home Economics. Prerequisite: 2-SE 411 or concurrently. Credit, 3 hours.

481g *Teaching Out-of-School Groups.* Planning and organization of instruction for offerings designed to meet vocational requirements, including wage-earning and parent education classes. Prerequisite: 2-SE 411 or equivalent. Credit, 2 hours.

521 *Recent Developments in Textiles.* The recent developments in the textile field as they affect the consumer. Prerequisite: HO 222. Credit, 2 hours.

522 *Pattern Design.* Distinction in design through the use of the flat pattern. Prerequisite: HO 321. Credit, 3 hours.

531 *Advanced Child Development.* Facts, concepts and techniques for interpreting and understanding personality development of children in the family. Prerequisite: HO 232 or 2-EE 313 or PY 240 or approval of instructor. Credit, 3 hours.

532 *The Meaning of Play.* Observation, analysis, and interpretation of play activities in relation to the development of the child. Prerequisite: HO 232 or 2-EE 313 or approval of instructor. Credit, 3 hours.

535 *Family Relationships in Later Years.* The developmental processes and generational relationships of the family in the later stages of the family-life cycle. Prerequisite: HO 331 or approval of instructor. Credit, 3 hours.

541 *Recent Developments in Nutrition.* Recent research in nutrition with view of finding practical applications. Prerequisite: HO 141. Credit, 2 hours.

542 *Recent Developments in Foods.* Recent developments in the food field which affect family food supply. Credit, 2 hours.

551 *Advanced Home Management.* Management concepts and research findings applied to problems of modern families. Credit, 2 hours.

581 *Supervision of Home Economics Education.* Practices and processes used by cooperating teachers working with student teachers, members of state supervising staffs, department heads, and coordinators of instructional programs in home economics. Prerequisite: Approval of instructor. Credit, 2 hours.

582 *Evaluation in Home Economics.* Procedures used in the broad content of evaluation applied to home economics, including the construction of objective and essay test items, self-evaluation devices, projective techniques, and use of standardized instruments. Prerequisite: HO 480 or equivalent. Credit, 3 hours.

583 *Recent Trends in Home Economics Education.* Identification of content and survey of techniques for teaching home economics. Prerequisite: HO 480 or equivalent. Credit, 2 hours.

HUMANITIES

PROFESSOR LAMM (Chairman of the Committee)

HUMANITIES

HU 101, 102 *Ideas and Values in the Humanities.* The interrelation of art, literature, music, and philosophy in the modern world. Credit for General Education given only when both HU 101, 102 are taken. Credit, 4 hours each semester.

301, 302 *The Humanities in the Western World.* An integrated course designed to develop a discriminating appreciation of art, music, literature, philosophy, and religion. The heritage of the past is presented in relation to life today. Credit given for attending selected plays, exhibitions, concerts. Credit for General Education given only when both HU 301, 302 are taken. Credit, 4 hours each semester.

401g *The Humanities in European Civilization.* A humanities study program of European travel. Emphasis on the study of fine arts with particular reference to music. Music festivals form a basic part of itinerary. Term paper required. Open to freshmen and sophomores upon approval of instructor. Offered summer only. Credit, 6 hours.

MASS COMMUNICATIONS

PROFESSORS ALISKY (SS 232), BROWN, ZACHER; ASSISTANT PROFESSORS ELLIS, JONES, LANCE; INSTRUCTOR BURGESS

DEPARTMENTAL MAJOR REQUIREMENTS—

BACHELOR OF ARTS DEGREE CURRICULUM

JOURNALISM, RADIO-TELEVISION—consists of 45 semester hours of credit of which 30 must be in mass communications and 15 in closely related fields approved by the adviser in consultation with the student. Both majors require MC 110 and 211. At least 18 semester hours must be in upper division courses.

BACHELOR OF SCIENCE DEGREE CURRICULUM

JOURNALISM, RADIO-TELEVISION—consists of 55 semester hours of which 13 hours must be in advertising and six hours in related courses. Courses MC 110 and 211 are required. At least 22 semester hours of credit must be in upper division courses.

DEPARTMENTAL MAJOR TEACHING FIELD REQUIREMENTS—

BACHELOR OF ARTS IN EDUCATION DEGREE CURRICULUM

MASS COMMUNICATIONS—consists of 45 semester hours of credit. Courses MC 110, 211, 212, 313, 320, 413, and 480 are required. An additional 26 hours, of which at least 11 must be in mass communications, will be approved by the adviser in consultation with the student. The remaining courses may be in mass communications or in closely related fields.

MASS COMMUNICATIONS

MC 110 *Mass Communications.* The communications industry, including the press, radio, and television; laboratory practice in news-gathering and news-writing. Prerequisite: EN 101. Two lectures, 2 hours laboratory. Credit, 3 hours.

200 *Fundamentals of Radio-Television.* The organization of broadcast stations, facilities and terminology of broadcasting. Prerequisite: MC 110. Credit, 3 hours.

211 *Reporting.* Study and practice in the coverage and writing of news; structure of the news story; laboratory practice. Prerequisite: MC 110. One lecture, 4 hours laboratory. Credit, 3 hours.

212 *Advanced Reporting.* Main types and sources of news; interviewing and re-writing; laboratory and *State Press* experience. Prerequisite: MC 211. One lecture, 4 hours laboratory. Credit, 3 hours.

232 *Radio-Television Announcing.* Techniques of radio and television announcing. Prerequisite: MC 110. Radio-television majors only. Credit, 3 hours.

300 *The Cinema in Mass Communications.* The motion picture as a mass medium. Credit, 3 hours.

311 *News Photography.* Instruction with field and laboratory practice in camera and darkroom techniques for newspaper and magazine photographic work. Prerequisite: MC 110 or approval of instructor. One lecture, 4 hours activity. Credit, 3 hours.

312 *Communications Law.* Legal aspects of the rights and responsibilities of the press, radio, and television; basic features of the law of libel, privilege, copyrights, access to information; background of court reporting. Credit, 3 hours.

313 *Copyreading and Editing.* Practical work in copyreading and headline writing; principles of typography and of makeup. Laboratory practice. Prerequisite: MC 212. One lecture, 4 hours laboratory. Credit, 3 hours.

314 *History of Communications.* American journalism from its English and colonial origins to the present day; development of radio and television, and the progression of the various media toward an industry of mass communications. Credit, 3 hours.

315 *Radio-Television News.* Techniques and practices of editing and preparing local and wire news copy for radio and television news broadcasts; laboratory practice in preparation of same for actual broadcasting. Prerequisite: MC 110. Credit, 3 hours.

320 *Staff Activity.* Experience and responsibility of editing and making up a complete newspaper as a member of its masthead staff. The University newspaper, the *State Press,* is used as the laboratory or work-project for this class. Prerequisite: MC 313. Credit, 2 hours.

321 *Radio-Television Drama.* The production of both radio drama and television drama, with emphasis on acting techniques appropriate to each form. Prerequisite: DR 112. Credit, 3 hours.

330 *International Communications.* Press and broadcasting of Latin America and selected European and Asian nations. Foreign correspondents for news agencies and broadcasting networks dealing with censorship and public opinion. Prerequisite: MC 110. Credit, 3 hours.

332 *Radio-Television Programming.* Principles of programming market stations, as well as modern networks. Two lectures, 2 hours laboratory. Credit, 3 hours.

336 *Television Production.* Planning, staging, and presentation, with practical experience as cameraman, floor manager, mike operator. Prerequisite: MC 232. Two lectures, 2 hours laboratory. Credit, 3 hours.

337 *Television Directing.* Theory and techniques of directing television programs of various types. Experience in directing productions. Prerequisite: MC 336. Two lectures, 2 hours laboratory. Credit, 3 hours.

340 *Magazine and Industrial Journalism.* General magazine and house organ publishing, writing, and editing. Credit, 3 hours.

401g *Public Relations Techniques.* Publicity methods; how to communicate through newspapers, magazines, radio-television stations, and other media. Prerequisite: MC 110. Credit, 2 hours.

411g *Special Assignment.* Selection and performance of a major project or projects on an individual basis. Prerequisite: MC 320. Credit, 2 to 5 hours.

412g *Editorial Interpretation.* The press as an influence upon public opinion. The editorial in analyzing and interpreting current events. Prerequisite: MC 110. Credit, 2 hours.

413g *Advising High School Publications.* Designed for high school journalism advisers. Problems of annual and newspaper staffs discussed. Credit, 2 hours.

421g *News Problems.* Seminar in journalism with emphasis upon editorial decisions required in the publishing of news. Prerequisite: Junior or senior standing. Credit, 3 hours.

431g *Television Writing.* Principles and techniques of writing for television with emphasis on television drama. Credit, 3 hours.

433g, 434g *Station Operation.* Radio and television programming and production. Specific assignments in the operation of college radio-television stations. Prerequisite: MC 332 or 336. Credit, 2 hours each semester.

472g *Radio-Television Station Management.* Organization, procedures, and policies of radio-television stations. Financial and creative basis of station operation. Consideration of personnel and production problems, relationship with advertising agencies, networks and sponsors. Prerequisites: 3-AD 301 and MC 332. Credit, 3 hours.

480g *Methods of Teaching Journalism.* Methods of instruction, organization, and presentation of appropriate content in journalism. Credit, 3 hours.

See related courses: 3-AD 301 *Advertising Principles;* 3-AD 371 *Radio-Television Advertising.*

MATHEMATICS

PROFESSORS NERING (PS-B233), FREUND, GRACE, HEATH, LOWENSTEIN, MILLER, SCOTT, SINKOV, WEXLER; ASSOCIATE PROFESSORS CARR, KELLY, LYON, PORTMANN, SAVAGE, SMITH; ASSISTANT PROFESSORS BEDIENT, BRYAN, GOLDSTEIN, LISKOVEC, LIVERMORE, MCCARTER, PECK, ROBINSON, SANSONE, SHERMAN, STEWART, SWIMMER; INSTRUCTORS LAKE, RUNDBERG, THOMPSON

DEPARTMENTAL MAJOR REQUIREMENTS—

BACHELOR OF ARTS DEGREE CURRICULUM

MATHEMATICS—consists of 45 semester hours of credit of which 30 must be in mathematics and 15 in closely related fields to be approved by the adviser in consultation with the student. Not more than 30 hours may be in courses offered by the department. Courses MA 120, 121, 212, 342 or 442, 404 or 408, and 470 are required. An additional nine hours, beyond MA 212, will be in mathematics courses; these may not include MA 380, 381, 407, 446, 480, 481, 483, or 484. At least 18 semester hours must be in upper division courses.

BACHELOR OF SCIENCE DEGREE CURRICULUM

MATHEMATICS—consists of 45 semester hours of credit of which at least 30 must be in mathematics and the remaining hours in closely related fields to be approved by the adviser in consultation with the student; all 45 hours may be in mathematics. Courses MA 120, 121, 212, 342 or 442, 404 or 408, and 470 are required. An additional nine hours or more, beyond MA 212, will be in mathematics courses; these may not include MA 380, 381, 407, 446, 480, 481, 483, or 484. At least 18 semester hours must be in upper division courses.

DEPARTMENTAL MAJOR TEACHING FIELD REQUIREMENTS—

BACHELOR OF ARTS IN EDUCATION DEGREE CURRICULUM

MATHEMATICS—consists of 45 semester hours of credit. Courses MA 120, 121, 212, 483, and 484 are required. An additional 12 hours in mathematics courses beyond MA 212 will be approved by the adviser in consultation with the student. The remaining 15 hours to complete the major may be in mathematics or in closely related fields.

DEPARTMENTAL GRADUATE PROGRAMS—

The Department of Mathematics offers programs leading to the degrees of Master of Arts and Doctor of Philosophy. Consult the Graduate Catalog for requirements.

MATHEMATICS

MA 116 *Intermediate Algebra.* The real number system, algebraic operations, polynomials, special products, factoring, functions and graphs, exponents, equations and their solutions. Meets three to five days a week. Credit, 3 hours.

117 *College Algebra.* Review of equations, fractions, exponents, radicals, inequalities, mathematical induction, binomial theorem, progressions, determinants, and theory of equations. Prerequisite: MA 116 or equivalent. Credit, 3 hours.

118 *Trigonometry.* The six trigonometric functions and their graphs, radian measure, identities and equations, inverse trigonometric functions, logarithms, solution of triangles. Prerequisite: MA 116 or equivalent. Credit, 2 hours.

120, 121 *Analytic Geometry and Calculus.* Prerequisites: MA 117, 118 or equivalent with grade of C or better. Meets 4 or 5 days a week. Credit, 4 hours each semester.

141 *Mathematical Analysis.* Sets, real number systems, algebraic relations, functions and graphs, analytic geometry, equations and inequalities, trigonometric functions. Prerequisite: MA 116 or equivalent. Credit, 4 hours.

205 *Mathematics for General Education.* The development of mathematics with emphasis on the influence of mathematics on other branches of culture. Fundamental aims, methods, and results are considered rather than development of techniques. Credit, 4 hours.

212 *Analytic Geometry and Calculus.* Prerequisite: MA 121. Meets 4 or 5 days a week. Credit, 4 hours.

220 *Differential Equations.* Methods of solution of differential equations of science and engineering, including series solutions. Prerequisite: MA 121. Credit, 3 hours.

241 *Mathematical Analysis.* Differential and integral calculus of polynomials, exponential, and logarithmic functions, arithmetic and geometric series; combinatorial probability. Credit in both MA 241 and 120 not permitted. Prerequisite: MA 141. Credit, 3 hours.

342 *Vector Spaces.* Mathematical systems and mathematical proofs with emphasis on vector spaces, linear transformations, and matrices. Prerequisites: MA 117, 118 or equivalent with grade of C or better. Credit, 3 hours.

360 *Differential Equations and Fourier Analysis.* Determinants and matrices; ordinary differential equations; Fourier Series and integrals; Laplace

transform; numerical methods. Prerequisite: MA 212. Not open to mathematics majors. Credit, 3 hours.

362 *Advanced Mathematics for Engineers.* Vector field theory; partial differential equations. Prerequisite: MA 360. Not open to mathematics majors. Credit, 3 hours.

380, 381 *Mathematics in the Elementary School.* Number and informal geometry. Materials suggested for use in the elementary school will be evaluated. Credit, 3 hours each semester.

404g *Projective Geometry.* Projective geometry and its relationship to Euclidean and other geometries. Prerequisite: MA 212. Credit, 3 hours.

407g *College Geometry.* Advanced plane geometry. Prerequisite: MA 212. Credit, 3 hours.

408g *Differential Geometry.* Curves and surfaces; curvature; invariants; geodesics. Prerequisite: MA 220 or 360 or 474. Credit, 3 hours.

410g *Topology.* Topology of the real numbers; equivalence of sets; transfinite induction. Prerequisite: MA 212. Credit, 3 hours.

426g *Probability.* Laws of probability, probability distribution and density functions, expected values and moments, limit theorems. Prerequisite: MA 212. Credit, 3 hours.

427g *Mathematical Statistics.* Sampling distributions, estimation and tests of hypotheses, regression, correlation, analysis of variance. Prerequisite: MA 426. Credit, 3 hours.

440g *Mathematics for the Social and Biological Sciences.* Set theory; probability theory; mathematical models. Prerequisite: MA 342. Credit, 3 hours.

442g *Vector Spaces and Matrix Theory.* Linear vector spaces and transformations; algebra of matrices; linear equations; eigenvalue and eigenvector theory; quadratic and Hermitian forms. Prerequisite: MA 212. Credit, 3 hours.

443g *Abstract Algebra.* Fundamental properties of groups, rings and fields; homomorphism theorems for groups and rings; integral domains and quotient fields. Prerequisite: MA 342 or 442 or approval of instructor. Credit, 3 hours.

445g *Theory of Numbers.* Prime numbers; the unique factorization theorem; congruences; Diophantine equations; primitive roots; the quadratic reciprocity theorem. Prerequisite: MA 212 or approval of instructor. Credit 3 hours.

446g *Theory of Equations.* Complex numbers; theorems and methods relating to the solutions of polynomial equations; numerical approximations; determinants and the solution of systems of linear equations. Prerequisite: MA 212. Credit, 3 hours.

460g *Applied Real Analysis.* Vector approach to functions of several variables, curvilinear coordinates, Jacobians and the implicit function theorem, multiple integrals, change of variables, line and surface integrals, Green's, Stoke's, and divergence theorems. Prerequisite: MA 212. Credit, 3 hours.

461g *Applied Complex Analysis.* Analytic functions; complex integration; Taylor and Laurent series; residue theorem; conformal mapping and harmonic functions. Prerequisite: MA 362 or 460 or equivalent. Credit, 3 hours.

462g *Partial Differential Equations.* Second order partial differential equations with emphasis on Laplace, wave, and diffusion equations; solutions by the methods of: characteristics, separation of variables, Green's function and integral transforms. Prerequisites: MA 220 or 360, 362 or 460. Credit, 3 hours.

463g *Transform Theory and Operational Methods.* Fourier, Laplace, and other transforms; applications to boundary value problems; generalized functions and modern operational mathematics. Prerequisites: MA 220 or 360, 461. Credit, 3 hours.

464g *Numerical Analysis.* Numerical solution of algebraic and transcendental equations; finite differences; interpolation; numerical differentiation and integration; numerical solution of ordinary differential equations. Prerequisites: MA 212 and a knowledge of computer programming. Credit, 3 hours.

465g *Numerical Analysis.* Numerical solution of ordinary differential equations, integral equations, and partial differential equations; matrices and determinants applied to the numerical solution of simultaneous linear equations; harmonic analysis; method of least squares and Chebyshev polynominals. Prerequisites: MA 220 or 360 and 464. Credit, 3 hours.

470g, 471g *Foundations of Analysis.* Real and complex numbers; point-set topology in Euclidean-space; limits and continuity; differentiation; Riemann-Stieltjes integration; functions of several variables; Jacobians; line and surface integrals. Prerequisites: MA 212 and 342 or 442. Credit, 3 hours each semester.

474g, 475g *Differential Equations.* Linear differential equations; regular singular points; existence and uniqueness theorems; systems; autonomous systems; Sturm-Liouville problems; simple partial differential equations. Prerequisite: MA 212. Credit, 3 hours each semester.

480g, 481g *Mathematics in the Upper Elementary Grades.* Arithmetic, algebra, and geometry appropriate for teachers of grades 6-8; appropriate materials and activities. Prerequisite: MA 381 or approval of instructor. Credit, 3 hours each semester.

483g *Mathematics in the Secondary School.* Selected topics related to structure in algebra. Prerequisite: Approval of instructor. Credit, 3 hours.

484g *Mathematics in the Secondary School.* Selected topics related to the structure in geometry. Prerequisite: Approval of instructor. Credit, 3 hours.

485g *History of Mathematics.* The origin and development of mathematical ideas beginning with geometry and algebra and continuing through selected topics in modern mathematics. Prerequisite: MA 212. Credit, 3 hours.

510, 511 *Point Set Topology.* Topological spaces, metric spaces, compactness, connectedness, local properties, product and decomposition spaces, mappings, covering properties, separation properties. Prerequisite: MA 410 or 470. Credit, 3 hours each semester.

513 *Algebraic Topology.* Homotopy theory, simplicial and singular homology, cohomology. Prerequisites: MA 443, 510, or approval of instructor. Credit, 3 hours.

520, 521 *Stochastic Processes.* Stochastic models, stationary processes, Poisson processes, renewal processes, Markov chains, generalized harmonic analysis. Prerequisite: MA 426. Credit, 3 hours each semester.

522 *Advanced Probability.* Probability measure, random variables and distributions, characteristic functions, limit theorems. Prerequisite: MA 426. Credit, 3 hours.

543, 544 *Modern Algebra.* Groups, modules, rings, and fields; Galois theory; linear algebras; representation theory. Prerequisite: MA 443. Credit, 3 hours each semester.

545 *Advanced Topics in Number Theory.* Topics selected from classical, analytic, additive, and algebraic number theory. Prerequisites: MA 445 and approval of instructor. May be repeated for credit. Credit, 1-3 hours.

547 *Group Theory.* Groups with operators; composition series; soluble groups; Abelian groups; Sylow's theorems. Prerequisite: MA 443. Credit, 3 hours.

549 *Advanced Topics in Algebra.* Topics selected from Galois theory, ring theory, algebraic number theory, and algebraic function theory. Prerequisites: MA 544 and approval of instructor. May be repeated for credit. Credit, 1-3 hours.

550, 551 *Methods of Mathematical Physics.* Topics selected from matrices, orthogonal functions, integral equations, calculus of variations, eigenvalue problems, perturbation methods, boundary value problems. Prerequisites: MA 342 or 442 or equivalent; 461 or 470 or equivalent. Credit, 3 hours each semester.

554 *Calculus of Variations.* Necessary and sufficient conditions of Euler, Weierstrass, Legendre, and Jacobi; direct methods and Dirichlet principle; Ritz and Galerkin methods of approximate solutions; applications to eigenvalue problems and partial differential equations. Prerequisite: MA 470. Credit, 3 hours.

565 *Advanced Numerical Analysis.* Modern numerical analysis techniques; relaxation methods; variational methods; methods for non-linear equations. Prerequisite: MA 465. Credit, 3 hours.

570, 571 *Functions of a Real Variable.* Point-set theory and metric spaces; Lebesgue integration; abstract measure theory; Lp spaces and linear functions; differentiation. Prerequisite: MA 470. Credit, 3 hours each semester.

572, 573 *Functions of a Complex Variable.* Analytic functions; complex integration; Taylor and Laurent series; residue theorem; partial fractions and infinite product representation of functions; Reimann mapping theorem; analytic continuation; harmonic functions; Dirichlet problem; Green's function; conformal mapping. Prerequisite: MA 470 (and 461 desirable). Credit, 3 hours each semester.

574, 575 *Theory of Ordinary Differential Equations.* Systems; existence proofs; singularities; asymptotic behavior of solutions; boundedness of solutions; eigenvalues and eigenfunctions; Rayleigh-Ritz methods; perturbation theory. Prerequisite: MA 572 or approval of instructor. Credit, 3 hours each semester.

576, 577 *Theory of Partial Differential Equations.* Existence and uniqueness theorems; boundary value and initial value problems; characteristics; Green's function; maximum principle; variational and operational methods; Sturm-Liouville theory. Prerequisite: A knowledge of Lebesgue integration or approval of instructor. Credit, 3 hours each semester.

578, 579 *Functional Analysis.* Metric, Banach and Hilbert spaces. Bounded and unbounded transformation, spectral theory, and application to classical analysis. Prerequisite: MA 570 or approval of instructor. Credit, 3 hours each semester.

580, 581 *Analysis for Teachers.* Subject matter in mathematics appropriate for accelerated programs in secondary schools, including analytic geometry and calculus. Prerequisite: Approval of instructor. Meets daily. Credit, 3 hours each semester.

582 *Modern Mathematics for Teachers.* Theory of sets, real number system, transfinite numbers, and other selected topics. Prerequisite: Approval of instructor. Credit, 3 hours.

583 *Abstract Algebra for Teachers.* The postulational approach to algebra; elementary mathematical systems, including groups and fields. Prerequisite: Approval of instructor. Credit, 3 hours.

586 *Probability and Statistics for Teachers.* Probability theory based on the theory of sets and the modern concepts of statistical inference; problems related to the teaching of statistics in high school. Prerequisite: Approval of instructor. Credit, 3 hours.

588 *Modern Geometry for Teachers.* Euclidean, projective, and non-Euclidean geometries. Prerequisite: Approval of instructor. Credit, 3 hours.

591 *Seminar.* Topics will be selected from the following:
- (a) *Analysis.* Credit, 2-3 hours.
- (b) *Applied Mathematics, Mathematical Physics.* Credit, 2-3 hours.
- (c) *Probability and Statistics.* Credit, 2-3 hours.
- (d) *Topology.* Credit, 2-3 hours.
- (e) *Algebra.* Credit, 2-3 hours.

STATISTICS

ST 226 *Modern Statistics.* The basic concepts and methods of statistics, including descriptive statistics, significance tests, estimation, sampling, and correlation. Not open to majors in mathematics or the physical sciences. Prerequisite: MA 116. Credit, 3 hours.

437g *Statistical Methods for Engineering and Physical Sciences.* Methods of experimental statistics including tests of hypotheses, analysis of variance, factorial experimentation. MA 427 and ST 437 may not both be counted for credit. Prerequisite: MA 212. Credit, 3 hours.

438g *Experimental Designs.* The principles of experimental design; analysis of special designs. Prerequisite: MA 427 or ST 437. Credit, 3 hours.

523 *Theory of Statistical Inference.* Theories of point and interval estimation, theories of tests of hypotheses. Prerequisite: MA 427. Credit, 3 hours.

524 *Theory of Least Squares.* General linear hypothesis, regression, analysis of variance. Prerequisites: MA 427, 442. Credit, 3 hours.

531 *Experimental Statistics.* Applications of statistical inference, the Markov theorem, multiple linear regression and correlation, linearizing transformations, discriminate analysis and other special problems. Prerequisite: ST 438. Credit, 3 hours.

539 *Statistical Laboratory.* The student is expected to participate in consultation problems with members of the statistical laboratory staff. Prerequisite: Approval of instructor. Credit, 1-3 hours.

See related courses: MA 426 *Probability;* MA 427 *Mathematical Statistics;* MA 520, 521 *Stochastic Processes;* MA 522 *Advanced Probability.*

MILITARY SCIENCE

PROFESSOR CURTIS; ASSISTANT PROFESSORS ADAMS, INGOLD, MOSER; INSTRUCTORS DEMARSCHE, EDNEY, PATTERSON

MILITARY SCIENCE

MS 101, 102 *Basic Military Science.* U. S. Army and national security; organization of the Army; individual weapons. Corequisite: Concurrent enrollment in an academic course as prescribed by the Department of Military Science and listed in the current Schedule of Classes. One lecture, one hour leadership laboratory. Credit, 1.5 hours each semester.

201, 202 *Basic Military Science.* American military history; map reading and aerial photography. Prerequisites: MS 101, 102 or equivalent. One lecture, one hour leadership laboratory. Credit, 1.5 hours each semester.

301 *Advanced Military Science.* Military teaching methods; organization, function and missions of the Arms and Services. Prerequisite: MS 201, 202 or equivalent (including basic camp of two-year program). Four lectures, one hour leadership laboratory. Credit, 4 hours.

302 *Advanced Military Science.* Small unit tactics and communications. Prerequisite: MS 201, 202 or equivalent (including basic camp of two-year program). Four lectures, one hour leadership laboratory. Credit, 4 hours.

401 *Advanced Military Science.* Operations; U. S. Army and world affairs. Prerequisites: MS 301, 302. Four lectures, one hour leadership laboratory. Credit, 4 hours.

402 *Advanced Military Science.* Military administration; military law; logistics; service orientation. Prerequisites: MS 301, 302. Four lectures, one hour leadership laboratory. Credit, 4 hours.

MUSIC

PROFESSORS BRUINSMA (Aud. 201), ANTOINE, BULLOCK, M. DRESSKELL, FLETCHER, LAMM, RIDER, SCOULAR; ASSOCIATE PROFESSORS AUTENRIETH, BOWERS, N. DRESSKELL, ENGLISH, HINES, KEATING, LOMBARDI, RICKEL, SEIPP, STELLHORN; ASSISTANT PROFESSORS BRITTON, CHAUSOW, GABLE, ISAAK, LOPRESTI, PUTNIK, M. W. SMITH, STALZER; INSTRUCTORS RATTERREE, M. M. SMITH

DEPARTMENTAL MAJOR REQUIREMENTS—

BACHELOR OF ARTS DEGREE CURRICULUM

MUSIC—consists of 45 semester hours of credit. Course work includes 12 semester hours of integrated theory, eight semester hours in the major performing medium, six semester hours of music history and literature and MU 320, 427. A piano proficiency examination is required. At least 18 semester hours must be in upper division courses.

BACHELOR OF MUSIC DEGREE CURRICULUM

MUSIC—consists of 84 semester hours of credit in music. Course work will depend on the musical status of the entering student. It may include 19 to 36 hours of music theory, 33 to 43 hours of applied music, 10 to 14 hours of music history and literature, and one to 12 hours of electives in music.

DEPARTMENTAL MAJOR TEACHING FIELD REQUIREMENTS—

BACHELOR OF ARTS IN EDUCATION DEGREE CURRICULUM

CHORAL MUSIC, INSTRUMENTAL MUSIC, CHORAL AND INSTRUMENTAL MUSIC — consists of 45 semester hours of credit including two years of integrated theory, MU 427 and 431 or 433; 15 to 19 hours of applied music (major performing area, piano and conducting), 4 to 6 hours of music history and literature, and 6 to 10 hours of music education.

DEPARTMENTAL GRADUATE PROGRAMS—

The Department of Music offers programs leading to the degrees of Master of Arts and Master of Music. Consult the Graduate Catalog for requirements.

MUSIC

MU 100 *Fundamentals of Music Notation.* To provide non-music majors with sufficient symbol literacy to begin work in the field of musical learning. No credit for music majors. Three hours a week. Credit, 2 hours.

107 *Introduction to Music.* The correlation of music with literature, science, and art. A non-technical course in the humanities primarily for non-music majors. Credit, 2 hours.

125, 126, 225, 226, 325 *Integrated Theory.* Basic theory needed for musicians to develop musical understandings and skills. Meets daily. Credit, 3 hours each semester.

311 *Music Methods for Lower Elementary Grades.* Development of the classroom music program for kindergarten through 4th grade. Four hours a week. Credit, 3 hours.

312 *Music Methods for Upper Elementary Grades.* Development of the classroom music program for 5th through 8th grade. Four hours a week. Credit, 3 hours.

313 *Methods of Teaching Music in the Elementary School.* Methods of instruction, organization, and presentation of appropriate content in music. For music majors and minors only. Credit, 3 hours.

320, 321 *Counterpoint.* First semester, strict counterpoint in modal style; second semester, strict and free tonal counterpoint. Prerequisite: MU 226. Credit, 2 hours each semester.

341, 342 *Music History and Literature.* Western music from the Greeks to the present day. Prerequisite: MU 226. Credit, 3 hours each semester.

349 *Theory and Practice of Tuning.* The principal tuning systems employed in music from 1500 to the present day. Limited to music majors of at least junior standing. Credit, 2 hours.

351, 352 *Service Playing.* Music for liturgical and non-liturgical church services. Development of such techniques as transposition, modulation, and improvisation. Credit, 3 hours each semester.

355 *Survey of American Music.* The growth and development of America's music. A humanities course for non-music majors. Credit, 2 hours.

356 *Survey of the Musical Theater.* An examination of music's place in the theater, viewed in terms of its historical importance and relative function. A humanities course for non-music majors. Credit, 2 hours.

423g, 424g *Composition.* Creative writing in the smaller forms including the use of harmonic textures and contrapuntal devices. Prerequisite: MU 325. Credit, 2 hours each semester.

427, 428g *Form and Analysis.* Harmonic and structural analysis of musical forms. Prerequisite: MU 226. Credit, 2 hours each semester.

429g, 430g *Canon and Fugue.* Polyphonic studies in form and technique. Prerequisite: MU 321. Credit, 2 hours each semester.

431g *Choral Arranging.* Arrangements for three, four, and more parts mixed choirs and glees; accompaniments; special effects. Emphasis upon choral requirements of school and radio performance. Prerequisite: MU 226. Credit, 2 hours.

433g, 434g *Orchestration.* Theoretical and practical study of scoring for orchestral instruments in various combinations, ranging from small ensembles to symphonic orchestra and concert band. Prerequisite: MU 226. Credit, 2 hours each semester.

441g *Baroque Music.* Seventeenth and early 18th century music. Prerequisite: MU 342 or graduate standing. Credit, 3 hours.

442g *Classic and Romantic Music.* Late 18th and 19th century music. Prerequisite: MU 342 or graduate standing. Credit, 3 hours.

443g *Ethnomusicology.* The non-Western music cultures of the world, the role of music in non-literate societies, and its relationship to other aspects of culture. Credit, 3 hours.

445g, 446g *Twentieth Century Music.* First semester, European music; second semester, American music. Prerequisite: MU 342 or graduate standing. Credit, 2 hours each semester.

449g, 450g *Music in Worship.* Historical survey of Plainsong, Anglican chant, Gregorian chant, Canticles, traditional liturgies, and forms of service. The transition from psalmnody into hymnody. The liturgical year in various faiths. Credit, 3 hours each semester.

451g *Repertoire.* The literature available for performance in all performing media. Prerequisite: Junior standing in major performance field. May be repeated for credit. Credit, 2 hours.

453g *Performance Practices of Early Music.* The manners of performance of earlier times, including rhythmic expression, ornamentation, and technique. Credit, 3 hours.

455g *Musicology.* Exploration of the fields of musicological activity. Prerequisite: MU 342 or graduate standing; reading knowledge of a foreign language recommended. Credit, 3 hours.

461g *Education Methods: Band and Orchestra.* Wind, string, and percussion methods and materials used in the development of junior and senior high school bands and orchestras. Prerequisite: Twenty semester hours of music. Credit, 2 hours.

462g *Elementary School Music Materials.* Books, music, primary instruments, phonograph records, and films for primary, intermediate and upper grades. Credit, 1 hour.

463g *Problems in Teaching Elementary School Music.* For elementary school teachers and for specialist teachers of music who wish to help classroom teachers to participate in teaching music to their students. Credit, 2 hours.

464g *Listening Activities in the Elementary School.* Phonograph recordings, films, and radio programs suitable for use with experience units in the elementary grades. For classroom teachers and music teachers. Credit, 2 hours.

466g *Listening Activities in the High School.* Designed to aid the teacher to develop the ability to train pupils in how to listen. Recordings, films, and other media are used to indicate the correlation of music with other forms of art. Credit, 2 hours.

480g *Methods of Teaching Music in the Secondary Schools.* Methods of instruction, organization, and presentation of appropriate content in music. Prerequisite: 2-SE 311 or concurrently. Credit, 3 hours.

481g *Performance Pedagogy and Materials.* Principles and methods of performance techniques for each performance field. Prerequisite: Senior standing or approval of instructor. Credit, 2 hours.

482g *Theory of Rhythm.* An integration of musical organization through physiological and psychological principles based upon rhythmic perception. Prerequisites: MU 428, 445; MP 339 or 340. Credit, 2 hours.

521 *Theory Techniques.* Theory techniques required of graduate students. Two hours a week. Credit, 1 hour.

523, 524 *Advanced Composition.* Creative writing in the larger forms for chorus, orchestra, and band. Prerequisites: MU 424, 428, 445, or equivalent. Credit, 2 hours each semester.

525, 526 *Pedagogy of Theory.* Practices and principles of teaching music theory. Emphasis directed towards setting up the most desirable and practical offerings possible. Comparative studies of existing practices throughout the United States. Prerequisite: MU 321 or equivalent. Credit, 3 hours.

527, 528 *Evolution of Musical Theory.* Harmonic theory from Pythagoras to the present. Prerequisite: MU 321. Credit, 3 hours each semester.

530 *Music Notation.* Early monophonic and polyphonic notation. May be repeated for credit. Credit, 3 hours.

531 *History of Musical Style.* Periods of music history treated from a stylistic viewpoint. Credit, 3 hours.

532 *Music Bibliography.* Investigations of the important primary and secondary sources for music research. Prerequisite: Reading knowledge of a foreign language recommended. Credit, 3 hours.

535 *Bach and Handel.* Credit, 3 hours.

536 *Renaissance Music.* Fifteenth and 16th century music. Credit, 3 hours.

537 *Haydn, Mozart, and Beethoven.* Credit, 3 hours.

541 *The Art Song.* Solo song from its beginning to the present day. Credit, 3 hours.

542 *Keyboard Literature.* From the Renaissance to the present day. Credit, 3 hours.

550 *Studies in Musical Curricula.* Scope and sequence of musical experiences. Development of criteria for the evaluation of musical curricula in terms of growth and interest. Prerequisite: A graduate course in curriculum. Credit, 3 hours.

564 *The Marching Band—Pageantry.* The marching band; performances at athletic events; various formations, mechanics of stunts. Prerequisite: Approval of instructor. Credit, 2 hours.

566 *Instrumental Literature for Schools.* Comprehensive study and analysis of all types of instrumental music. Prerequisites: MU 461 or 481 and experience in bands and orchestras. Credit, 3 hours.

567 *The School Music Program.* The problems, obligations, and opportunities of the music administrator. Credit, 3 hours.

570 *Choral Literature for Schools.* Comprehensive study and analysis of all types of choral music. Prerequisites: MU 481 and experience in choral groups. Credit, 3 hours.

591 *Seminar.* Topics will be selected from the fields of music education, music history, and music theory:

- (a) *Ancient and Medieval Music.* Credit, 3 hours.
- (b) *Ethnomusicology.* Credit, 3 hours.
- (c) *American Music to* 1900. Credit, 3 hours.
- (d) *Jazz.* Credit, 3 hours.
- (e) *Contemporary Compositional Techniques.* Credit, 3 hours.
- (f) *Symphonic Literature.* Credit, 3 hours.
- (g) *Chamber Music Literature.* Credit, 3 hours.

MUSIC PERFORMANCE

MP 111, 311, 511 *Applied Music—Private Instruction.* Piano, organ, harpsichord, voice, violin, viola, violoncello, contrabass, flute, oboe, clarinet, bassoon, saxophone, trumpet, cornet, French horn, baritone, trombone, tuba, percussion. Placement examination required. Two half-hour lessons a week. May be repeated for credit. Credit, 2 hours each semester.

121, 321, 521 *Applied Music—Private Instruction.* Piano, organ, harpsichord, voice, violin, viola, violoncello, contrabass, flute, oboe, clarinet, bassoon, saxophone, trumpet, cornet, French horn, baritone, trombone, tuba, percussion. Placement examination required. One half-hour lesson a week. May be repeated for credit. Credit, 1 hour.

125 *Basic Instruction.* Applied music instruction for those developing a secondary performance area and for those who do not meet the proficiency levels of MP 111. Placement examination required. Two hours a week. May be repeated for credit. Credit, 1 hour each semester.

127, 327, 527 *Applied Music—Private Instruction.* Performance majors only. Piano, organ, harpsichord, voice, violin, viola, violoncello, contrabass, flute, oboe, clarinet, bassoon, saxophone, trumpet, cornet, French horn, baritone, trombone, tuba, percussion. Placement examination required. Two half-hour lessons a week. May be repeated for credit. Credit, 2 or 4 hours each semester.

131, 132, 231, 232 *Class Piano.* A four-semester sequence of courses designed for those lacking piano experience and those who need piano as a classroom tool. Emphasis on keyboard technique, sight reading, simple accompaniments and improvisation. Two hours a week. Credit, 1 hour each semester.

133, 134 *Class Voice.* Open to all students interested in the development of basic singing techniques. Two hours a week. Credit, 1 hour each semester.

209 *Elements of Conducting.* Essentials of conducting techniques used by both choral and instrumental conductors. Two hours a week. Credit, 1 hour.

235, 236 *Educational Methods for Strings.* Practical class in gaining the string knowledge necessary for instrumental teachers in public schools. Three hours a week. Credit, 1 hour each semester.

237, 238 *Educational Methods for Brass.* Practical class in gaining the brass knowledge necessary for instrumental teachers in public schools. Three hours a week. Credit, 1 hour each semester.

336 *Educational Methods for Percussion.* Practical class in gaining percussion knowledge necessary for instrumental teachers in public schools. Three hours a week. Credit, 1 hour.

337, 338 *Educational Methods for Woodwinds.* Practical class in gaining the woodwind knowledge necessary for instrumental teachers in public schools. Three hours a week. Credit, 1 hour each semester.

339 *Choral Conducting.* Elements of choral technique and interpretation. Required of music education vocal students. Prerequisite: MP 209. Three hours a week. Credit, 2 hours.

340 *Instrumental Conducting.* Fundamentals of score reading, and interpretation of instrumental music. Required of all music education instrumental major students. Prerequisite: MP 209. Three hours a week. Credit, 2 hours.

345 *Symphony Orchestra.* Open to all students who can qualify on the basis of auditions with the director. Over a four-year period, the student is introduced to the great masterpieces of symphony orchestra literature. Five hours a week. May be repeated for credit. Credit, 1 hour.

351 *Choral Union.* Open to all students in the University and to interested singers in the community. Time devoted to preparation and performance of the larger choral works. Rehearsals are held one evening a week for two hours. May be repeated for credit. Credit, 1 hour.

352 *Concert Choir.* Membership chosen by audition. May be repeated for credit. Four hours a week. Credit, 1 hour.

355 *Men's Glee Club.* Open to all male students in the University who can qualify on the basis of auditions with the director. Experience in rehearsal and performance of music for male voices. Public performances. Three hours a week. May be repeated for credit. Credit, 1 hour.

357 *Women's Chorus.* Membership chosen by audition. Three hours a week. May be repeated for credit. Credit, 1 hour.

361 *Symphonic and Marching Band.* Open to all students who can qualify on the basis of auditions with the director. In addition to the staging of formations and drills for football games and other events, the student is

introduced to the great masterpieces of symphonic band literature over a period of four years. Meets daily. May be repeated for credit. Credit, 1 hour.

371 *Opera Workshop.* Open to all students who can qualify on the basis of auditions with the director. Rehearsal and performance of operatic works. Study of practical production problems in the musical theatre. Several public productions yearly. May be repeated for credit. Credit, 1 hour.

381 *Chamber Music Ensembles.* String, brass, woodwind, percussion, keyboard, vocal and mixed ensembles. Prerequisite: Approval of instructor. Two hours a week. May be repeated for credit. Credit, 1 hour.

382 *Collegium Musicum.* Singers and instrumentalists specializing in the performance of early and unusual music. Prerequisite: Approval of instructor. Two hours a week. May be repeated for credit. Credit, 1 hour.

383 *University Singers.* Small choral ensemble chosen by audition. Two hours a week. May be repeated for credit. Credit, 1 hour.

539 *Advanced Conducting.* The study and practice of advanced baton technique for band and orchestra. Score reading, mechanics of conducting, individual criticisms of style. Prerequisites: MP 339, 340 or equivalent. Credit, 2 hours.

595, 596 *Solo Performance.* For Master of Music candidates in applied music only. May be full recital, major operatic role, solo performance with orchestra, or an ensemble or lecture recital. Credit, 1 hour each semester.

NURSING

PROFESSOR HANNER (Anx XVI 3); ASSOCIATE PROFESSORS JAHRAUS, JOHNSON, WALKER; ASSISTANT PROFESSORS BRUNER, CORONA, LOGE, MCLEOD, NACZKI, SATCHELL, STUMPF, THEOBALD; INSTRUCTORS BLEWETT, BRADFORD, BREGG, CORLISS, FINCH, HUHNKE, KOKENA, SPRAGINS, WURZELL, ZIEBARTH

BACHELOR OF SCIENCE IN NURSING DEGREE CURRICULUM

The candidate for a degree of Bachelor of Science in Nursing shall have completed at least 128 credits of University work. The curriculum is designed to include 40 credits in General Education (lower division—37, upper division—3); 20 credits in related and non-nursing courses (lower division—17, upper division—3); 60 credits in the nursing major (lower division—15, upper division—45); and 8 credits in electives. The required program of study will be found in the College of Nursing Bulletin.

NURSING

NU 201 *Introduction to Nursing.* Background, purpose and functions of the nursing profession and its relationship to other health professions and community agencies. Two hours lecture-discussion. Credit, 2 hours.

202 *Nursing Science.* The basic concepts inherent in nursing as derived from the behavioral, social, physical and biological sciences with the opportunity for the application of principles in the laboratory and clinical nursing area. Prerequisite: Completion of or concurrent registration in lower division science courses required in the nursing program. Three hours lecture, 2 hours clinical discussion, 8 hours clinical experience. Credit, 6 hours.

211 *Human Relationships in Nursing.* Provides opportunity for development of beginning understanding and skills fundamental to effective interpersonal relations. Prerequisites: PY 112, and HO 232 or PY 240, or concurrent registration, or approval of instructor. Two hours lecture-discussion, 1 hour laboratory. Credit, 2 hours.

212 *Human Relationships in Nursing.* Understanding and skills essential to constructive interpersonal relationships. Prerequisites: NU 211 and approval of instructor. Two hours discussion. Credit, 1 hour.

221 *Psychiatric Nursing.* Behavioral theories and clinical application in the care of emotionally disturbed patients. Prerequisites: NU 211 and/or approval of instructor. Four hours lecture-discussion, 8 hours supervised practice. Credit, 6 hours.

303 *Nursing Science.* Continuation of NU 202. Prerequisites: NU 202 and ZO 202 or approval of instructor. One hour lecture, 2 hours discussion. Credit, 2 hours.

306 *Modern Professional Nursing.* New concepts and trends in professional practice and nursing education. Prerequisites: EN 101, 102 and approval of instructor. Credit, 3 hours.

307, 308 *Psychodynamics of Nursing.* Concepts basic to interpersonal relations in nursing. Limited to registered nurse students. Prerequisites: PY 112, PY 240 or HO 232 and/or approval of instructor. Two hours discussion, 1 hour clinical experience. Credit, 2 hours each semester.

331, 332 *Maternal and Child Nursing.* The role of the nurse as related to the individual needs and health problems of the mother and child during pregnancy, parturition, puerperium, childhood and adolescence. Students must provide transportation for required home visits. Prerequisites: Junior standing in the nursing major or approval of instructor. Four hours lecture, 12 hours supervised practice and 4 hours conference. Credit, 9 hours each semester.

360 *Recent Advances in Nursing.* Advanced study and/or supervised practice in a specialized area in nursing. Credit in different areas of study may be accumulated to 5 hours. Credit, 1-5 hours.

407 *Nursing Continuum.* Intensive study of a patient and his nursing care needs based on the use of problem solving techniques and application of this knowledge in execution of a comprehensive nursing care plan. Limited to registered nurse students enrolled in the nursing major. Prerequisite: Senior status in the nursing program. Two hours lecture, 4 hours conference, 8 hours clinical practice. Credit, 6 hours.

441, 442 *Medical and Surgical Nursing.* The comprehensive care of patients with selected medical-surgical conditions, emphasizing the scientific principles basic to professional nursing. Includes concepts of those leadership abilities which will enhance personal and professional growth of the nurse. Prerequisite: NU 331, 332 or approval of instructor. First semester: One hour lecture, 4 hours conference, 16 hours supervised practice. Credit, 9 hours. Second semester: One hour lecture, 2 hours conference, 12 hours supervised practice. Credit, 6 hours.

452 *Public Health Nursing.* Relates principles of the public health sciences and public health nursing to community organization for health services. Concepts of public health philosophy, administration, vital statistics, epidemiology and environmental sanitation are coordinated with the

public health nursing clinical experience. Particular consideration is given to the health needs of the individual, the family and groups of people in the home, the school, at work and in the community. Students must provide transportation for home visits to families. Prerequisite: Senior status in the nursing program or approval of instructor. Two hours lecture, 8 hours supervised practice including 2 hours clinical discussion. Credit, 4 hours.

453 *Public Health Nursing.* Continuation of NU 452. Prerequisite: Senior status in the nursing program or approval of instructor. Two hours lecture, two hours conference, 12 hours supervised practice. Credit, 6 hours.

PHILOSOPHY

PROFESSORS REIN'L (SS 402F), ARNER, BRACKEN; ASSISTANT PROFESSORS GIESCHEN, HOWELLS, MACDONALD, STARSKY, VOTICHENKO

DEPARTMENTAL MAJOR REQUIREMENTS—
BACHELOR OF ARTS DEGREE CURRICULUM

PHILOSOPHY—consists of 45 semester hours of credit of which 30 must be in philosophy and 15 in approved courses within related fields. Courses PI 322, 323, and 332 are required, and at least three semester hours of upper division courses must be taken in *each* of the following areas of study: logic and theory of knowledge, metaphysics, moral and social philosophy, and history of philosophy. At least 18 hours must be in upper division courses.

DEPARTMENTAL GRADUATE PROGRAMS—

The Department of Philosophy offers programs leading to the degree of Master of Arts. Consult the Graduate Catalog for requirements.

PHILOSOPHY

PI 101 *Introduction to Philosophy.* Leading philosophic ideas in Western thought. Credit, 3 hours.

103 *Elementary Logic.* The methods and principles used in distinguishing correct from incorrect reasoning, both deductive and inductive. Credit, 3 hours.

211 *Social and Moral Philosophy.* Chief problems and traditional theories of moral and social philosophy. Credit, 3 hours.

304 *Theory of Knowledge.* The logical structure and experimental basis of human knowledge. Prerequisite: Three hours in philosophy or approval of instructor. Credit, 3 hours.

306 *Philosophy of Science.* The structure of scientific concepts, laws, and theories; the nature of scientific explanation; confirmation and the problem of induction. Credit, 3 hours.

309 *Metaphysics.* Selected problems, such as conceptions of existence, process, and law. Prerequisite: Three hours in philosophy or approval of instructor. Credit, 3 hours.

312 *Social and Political Philosophy.* Philosophic problems concerning the foundations of state and society, such as sovereignty, law, and the sources

of ideological conflicts of modern times. Prerequisite: Three hours in philosophy or approval of instructor. Credit, 3 hours.

314 *Philosophy of History.* Theories concerning the nature of history, the idea of progress, historical inevitability, the role of the great man, etc. Prerequisite: Three hours in philosophy or approval of instructor. Credit, 3 hours.

322 *Ancient and Medieval Philosophy.* The pre-Socratics to the beginning of the modern period. Credit, 3 hours.

323 *Modern Philosophy.* The beginning of the modern period to the 20th century. Credit, 3 hours.

325 *American Philosophy.* American philosophical thought from its beginning to the present. Credit, 3 hours.

327 *Recent Empirical and Analytic Philosophy.* Nineteenth and 20th century empiricism, positivism, pragmatism, and linguistic analysis. Prerequisite: Three hours in philosophy or approval of instructor. Credit, 3 hours.

328 *Recent Idealistic and Existentialist Philosophies.* Nineteenth and 20th century idealism, voluntarism, and existentialism. Credit, 3 hours.

332 *Symbolic Logic.* Principles of sentential and quantificational logic. Application to ordinary reasoning. Prerequiiste: PI 103 or approval of instructor. Credit, 3 hours.

340 *Philosophy of Human Nature.* A philosophical investigation of such problems as the structure of the mind, the mind-body relation, the nature of self; a consideration of the philosophical implications of more recent psychological thought. Prerequisite: Three hours in philosophy or approval of instructor. Credit, 3 hours.

341 *Philosophy of Religion.* An inquiry concerning such problems as the nature of religion, the grounds of religious belief, the concept of God, and the problem of evil. Credit, 3 hours.

415g *Problems of Ethics.* Selected problems of normative and analytic ethics. Prerequisite: PI 211 or approval of instructor. Credit, 3 hours.

421g *Plato.* The middle and later dialogues. Prerequisite: Six hours in philosophy or approval of instructor. Credit, 3 hours.

422g *Aristotle.* One or more of the major works. Prerequisite: Six hours in philosophy or approval of instructor. Credit, 3 hours.

423g *Medieval Philosophy.* Investigation of such philosophers as Augustine, Anselm, Scotus Erigena, Thomas Aquinas, and others. Prerequisite: Six hours in philosophy or approval of instructor. Credit, 3 hours.

425g *Continental Rationalism.* The major philosophical works of Descartes, Spinoza, Leibnitz, Malebranche, and others. Prerequisite: Six hours in philosophy or approval of instructor. Credit, 3 hours.

426g *British Empiricism.* The major philosophers in the empirical tradition; the works of Hobbes, Locke, Berkeley, Hume, and Mill emphasized. Prerequisite: Six hours in philosophy or approval of instructor. Credit, 3 hours.

427g *Kant.* Kant's philosophy, its relationship to previous philosophic traditions and present philosophic problems. Prerequisite: Six hours in philosophy including PI 322 or 323. Credit, 3 hours.

433g *Advanced Symbolic Logic.* Axiomatic development of the sentential calculus and the lower functional calculus. Prerequisite: PI 332 or approval of instructor. Credit, 3 hours.

435g *Philosophical Semantics.* The fundamental concepts of philosophical analysis such as meaning, truth, reference, predication, analyticity from the point of view of both natural language and formal language. Prerequisite: PI 332 or 6 hours of philosophy or approval of instructor. Credit, 3 hours.

436g *Philosophy of Mathematics.* The basis of mathematics, the structure of mathematical systems, and the relation between mathematics and the empirical sciences. Prerequisite: PI 332 or approval of instructor. Credit, 3 hours.

PHYSICS

PROFESSORS STONER (PS-B133), KEVANE, KYRALA, MEISTER, MUNCH, NIGAM, ROY, WAGER, WORK; ASSOCIATE PROFESSORS HENDERSON, RAWLS, SCHROEDER, SNYDER, YALE; ASSISTANT PROFESSORS JACOB, LU; INSTRUCTORS IMPSON, VOSS

DEPARTMENTAL MAJOR REQUIREMENTS—

BACHELOR OF SCIENCE DEGREE CURRICULUM

PHYSICS—consists of 45 semester hours of credit, of which 18 must be in upper division courses. Required courses are PH 222, 232, 322, 332, 461, 462, and three hours of advanced laboratories, one of which shall be PH 333. Additional courses in physics and upper division mathematics will be selected with the approval of the adviser. Each student must obtain credit in one year of French, German, Russian, or other foreign language approved by the adviser.

DEPARTMENTAL MAJOR TEACHING FIELD REQUIREMENTS—

BACHELOR OF ARTS IN EDUCATION DEGREE CURRICULUM

GENERAL SCIENCE—consists of 45 semester hours of credit. Required courses are MA 116 or 117, 118; PH 101 (or PH 111, 112 with MA 118 prerequisite); CH 111, 231; ZO 100, 360; BO 100, 360; GL 126; GE 411; PL 121 or 321, 460 or 480. The remaining courses to complete the major must be in upper division physical or biological sciences.

PHYSICS—consists of 45 semester hours of credit. Required courses are CH 113, 115; PH 111, 112 (or 115, 116) 222, 232, 450, 460, 480, 2 hours of 463; PL 410. The remaining hours to complete the major may be chosen from physics courses approved by the adviser.

DEPARTMENTAL GRADUATE PROGRAMS—

The Department of Physics offers programs leading to the degrees of Master of Science, and Doctor of Philosophy. Consult the Graduate Catalog for requirements. The Department has administrative responsibility for the interdepartmental program leading to the degree of Master of Natural Sciences.

PHYSICAL SCIENCE

PL 110 *Physical Universe.* The universe as a unit; the stars; the solar system; the earth and the atom. The nature of matter and energy. Three lectures, 2 hours laboratory. Credit, 4 hours.

121 *Descriptive Astronomy.* The solar system and stars from the observational and descriptive viewpoint. Credit, 2 hours.

320 *Science for the Elementary School.* Development of an integrated science program in each grade of the elementary school. Activities include laboratory, classroom observation and participation, and a three-day field trip. Prerequisites: PL 110, BI 100, or equivalent. Four hours a week. Credit, 3 hours.

321 *General Astronomy.* The solar system; motions of the planets; eclipses, stars, galaxies; and an introduction to navigation and astrophysics. Prerequisite: PH 101 or equivalent. Credit, 3 hours.

361, 362 *Science and Man.* The effects upon man of his technological civilization and a consideration of recent advances in both pure and applied physical sciences. May be taken in either order. Credit, 2 hours each semester.

410g *History of Physical Sciences.* The growth of astronomy, chemistry, and physics; the scientists who have made outstanding contributions, and the effects of these contributions on man's life. Credit, 3 hours.

460g *Science in the Junior High School.* Development of an integrated classroom and laboratory program. Prerequisite: PL 320 or equivalent. Two lectures, 3 hours laboratory. Credit, 3 hours.

480g *Methods of Teaching Physical Science.* Methods of instruction, organization, and presentation of appropriate content in physical science. Prerequisites: 2-SE 311, 15 hours of physical science or approval of instructor. Credit, 3 hours.

PHYSICS

PH 101 *Introduction to Physics.* The fundamental principles of physics, presented with a minimum of mathematics, to give the student an understanding of the concepts of physics as applied to everyday life. Three lectures, 3 hours laboratory. Credit, 4 hours.

111 *General Physics.* The fundamental principles of mechanics, heat, and sound with an emphasis on applications to professional scientific fields. Prerequisite: MA 118. Three lectures, 1 recitation, 2 hours laboratory. Credit, 4 hours.

112 *General Physics.* The fundamental principles of electricity, magnetism, and light. Prerequisite: PH 111. Three lectures, 1 recitation, 2 hours laboratory. Credit, 4 hours.

115 *General Physics.* Principles of mechanics, heat and sound, using calculus. Designed for students majoring in scientific and technical areas. Prerequisite: MA 120 or concurrently. Three lectures, 2 recitations, 2 hours laboratory. Credit, 5 hours.

116 *General Physics.* Principles of electricity, magnetism and optics, using calculus. Designed for students majoring in scientific and technical areas. Prerequisites: PH 115; MA 121 or concurrently. Three lectures, 2 recitations, 2 hours laboratory. Credit, 5 hours.

222 *Analytical Mechanics.* Vector treatment of statics, kinematics and dynamics of particles and rigid bodies, including forced damped coupled oscillators, collisions, central force orbits and scattering potentials. Prerequisites: PH 115, MA 121, or approval of instructor. Credit, 4 hours.

232 *Electromagnetic Theory.* Electric fields, potentials, Gauss' law, electrostatics of conductors and dielectric materials, DC and AC circuits, Ampere's and Faraday's laws. Prerequisites: PH 116, MA 212, or approval of instructor. Credit, 4 hours.

251 *Sound and Optics.* Basic principles of sound and optics including a general discussion of wave motion and physical and geometrical optics. Prerequisites: 4-ES 211; MA 212. Credit, 2 hours.

301 *Theoretical Physics.* Algebraic eigenvalue problems, Green's functions, differential eigenvalue problems, special functions, asymptotic and approximation methods, Fourier and Laplace transforms as applied to physical problems. Prerequisites: MA 220; PH 222. Credit, 3 hours.

302 *Theoretical Physics.* Variational calculus, integral equations, probabilities, and introductory concepts of groups, rings, fields, hyper complex numbers, and their matrix representations as applied in physics. Prerequisite: PH 301. Credit, 3 hours.

320 *Musical Acoustics.* Simple vibrating systems, analysis of a musical tone into components, loudness and pitch characteristics of the ear, tone production mechanisms of stringed, reed, and brass instruments, correlation between the rules of harmony and the laws of acoustics. Prerequisite: Two years of theory advisable. Credit, 4 hours.

322 *Analytical Mechanics.* Lagrangian and Hamiltonian methods applied to problems in particle, rigid body and continuum mechanics. Prerequisite: PH 222. Credit, 3 hours.

324 *Mechanics and Heat Physical Measurements.* Prerequisite: Enrollment in PH 222. Three hours laboratory. Credit, 1 hour.

332 *Electromagnetic Fields.* Solutions of Laplace's equation, magnetic materials, equation of continuity, scalar and vector potentials, Maxwell's equations, plane and guided electromagnetic waves. Prerequisites: PH 222, 232; MA 220. Credit, 3 hours.

333 *Electricity and Magnetism Physical Measurements.* Prerequisite: Enrollment in PH 232. Three hours laboratory. Credit, 1 hour.

334 *Electricity and Magnetism Physical Measurements.* Prerequisite: PH 333. Three hours laboratory. Credit, 1 hour.

341 *Intermediate Heat and Thermodynamics.* Principles of heat energy with an introduction to thermodynamics. Prerequisites: PH 116; MA 212. Credit, 3 hours.

361 *Modern Physics.* Fundamental principles of spectroscopy, x-rays, nuclear theory, cosmic rays and photoelectricity. Prerequisites: 4-ES 231 and MA 360 or equivalent. Credit, 3 hours.

434g *Physical Electronics.* Characteristics of non-linear elements; vacuum tubes and transistors. Basic circuits and their applications in physical measurements. Prerequisite: PH 232. Two lectures, 3 hours laboratory. Credit, 3 hours.

442g *Statistical Physics.* Probability and statistics applied to physical systems; kinetic theory, classical and quantum statistical mechanics; relation to thermodynamics; elements of transport theory. Prerequisites: PH 341; MA 220. Credit, 3 hours.

450g *Elements of Optics.* Principles and applications of geometrical and physical optics. Designed for teachers and students not majoring in physics. Prerequisites: PH 112 or 116; MA 212. Credit, 3 hours.

451g *Optics.* Physical and geometrical optics based on the Maxwell equations, including reflection, refraction, interference, simple diffraction theory and metal optics. Prerequisites: PH 332; MA 220 or 360. Credit, 3 hours.

452g *Advanced Optics.* Geometrical theory of optical imaging, rigorous diffraction theory, interference and diffraction with partially coherent light, fiber optics, crystal optics, masers and lasers. Prerequisite: PH 451. Credit, 3 hours.

453g *Optics Physical Measurements.* Prerequisite: Enrollment in PH 451. Three hours laboratory. Credit, 1 hour.

460g *Elements of Atomic Physics.* Recent advances in atomic physics. Designed for teachers and students not majoring in physics. Prerequisite: One year of college physics. Credit, 3 hours.

461g *Atomic Physics.* Properties of electrons, quantum nature of light, the nuclear atom, Bohr-Sommerfeld theory, de Broglie waves, uncertainty principle, Schrödinger equation, atomic spectra, X-rays. Prerequisites: PH 222, 232; MA 220. Credit, 3 hours.

462g *Nuclear Physics.* Static properties of nuclei, natural and induced radioactivity, nuclear reactions, nuclear models, interaction of gamma rays and electrons with matter. Prerequisite: PH 461. Credit, 3 hours.

463g *Physical Measurements.* Selected experiments in mechanics and heat, electricity and magnetism, optics and modern physics. Designed for teachers and students not majoring in physics. Prerequisite: PH 112. Three hours laboratory. May be repeated for a maximum of 4 hours credit. Credit, 1 hour.

464g *Elements of Nuclear Physics.* Fundamentals of nuclear physics. Designed for teachers and students not majoring in physics. Prerequisites: PH 112, 460 or equivalent. Credit, 3 hours.

465g *Atomic Physics Physical Measurements.* Prerequisites: PH 333 and enrollment in PH 461. Three hours laboratory. Credit, 1 hour.

466g *Nuclear Physics Physical Measurements.* Prerequisites: PH 333 and enrollment in PH 462. Three hours laboratory. Credit, 1 hour.

471g *Quantum Mechanics.* Wave mechanics: Schrödinger's equation, potential barrier problems, harmonic oscillator, hydrogen atom, perturbation theory; operational methods, matrix mechanics, angular momentum. Prerequisites: PH 322, 461, or approval of instructor. Credit, 4 hours.

480g *Methods of Teaching Physics.* Experience in problem solving; preparation of demonstrations, experiments, and projects; organization of laboratories. Designed primarily for secondary school physics teachers. Prerequisites: 2-SE 311 and 15 hours of physics, or approval of instructor. Credit, 3 hours.

481g *Solid State Physics.* Structure, elastic properties and dynamics of crystals; electron motions in crystals under applied fields; selected topics. Prerequisite: PH 471. Credit, 3 hours.

482g *Physics of Semiconducting Materials.* Brillouin zones and electron energy bands; impurity states, electron statistics and electrical conduction; carrier mobility and Hall effect; non-equilibrium effects, recombination. Prerequisite: PH 471. Credit, 3 hours.

501 *Methods of Theoretical Physics.* Physical applications of functions of a complex variable, boundary and initial value problems of scalar and vector fields in partial differential and integral form, Green's functions and topics selected from operator algebra, tensor and spinor calculus and quaternions. Prerequisite: Approval of instructor. Credit, 3 hours.

502 *Methods of Theoretical Physics.* Variational principles, perturbation methods, wave propagation, diffusion, potential theory and topics selected from Lorentz invariants, theory of second quantization and group representations. Prerequisite: Approval of instructor. Credit, 3 hours.

516, 517 *Physics for In-Service Teachers.* Concepts and principles of physics. Prerequisite: Approval of instructor. Credit, 3 hours each semester.

521, 522 *Classical Mechanics.* Variational principles, Lagrange's and Hamilton's equations; rigid body motion; canonical transformations, Hamilton-Jacobi theory; continuum mechanics; elements of hydrodynamics, elasticity theory and special relativity; selected topics. Prerequisite: PH 322. Credit, 3 hours each semester.

523 *Theory of Relativity.* Special theory of relativity and introduction to the general theory. Prerequisites: PH 522, 532, or approval of instructor. Credit, 3 hours.

531, 532 *Electromagnetic Theory.* Solution of static problems in orthogonal coordinate systems by separation of variables and by Green's functions, multipole fields, gauge transformations, plane waves in various media, wave guides and resonant cavities, 4-vectors, field covariance, transformation of fields, Lienard-Wiechert potentials and fields, radiation. Prerequisites: PH 332; MA 460, or equivalent. Credit, 3 hours each semester.

541 *Advanced Thermodynamics.* Problems in thermodynamics including phase changes and phase equilibrium, liquefaction of gases and liquid helium, superconductivity and fluctuation. Prerequisites: PH 442, 471. Credit, 3 hours.

542 *Statistical Mechanics.* Review of quantum mechanics. Statistical interpretation of thermodynamics; partition functions. Ideal gases, magnetism and specific heats. Prerequisite: PH 541. Credit, 3 hours.

543 *Plasma Physics.* Fundamental physical phenomena in the plasma state: equilibrium and stationarity, oscillations and wave propagation, conduction, diffusion and radiative phenomena. Prerequisite: Approval of instructor. Credit, 3 hours.

544 *Theory of Liquids and Dense Gases.* Recent advances in the theory of the equations of state of dense fluids. Mayer's cluster theory, lattice and hole theories, radial distribution function and the superposition approximation, quantum liquids with applications to superfluidity. Prerequisites: PH 541, 542 or approval of instructor. Credit, 3 hours.

545 *Low Temperature Physics.* Liquid and solid helium, electrical and thermal conductivity, superconductivity and magnetic properties at temperatures approaching absolute zero. Prerequisites: PH 332, 442, or equivalent. Credit, 3 hours.

561, 562 *Nuclear Physics.* Two nucleon interactions, Clebsch-Gordon coefficients, internucleon forces, meson theory and high energy scattering, nuclear binding energy, nuclear models, transition probability estimates, nuclear reactions, beta decay. Prerequisites: PH 462, 471. Credit, 3 hours each semester.

563 *Atomic Spectra and Structure.* Atomic spectra from the viewpoint of quantum mechanics, including selection rules, intensities, the Stark and Zeeman effects, and hyperfine structure. Prerequisite: PH 576. Credit, 3 hours.

564, 565 *Molecular Spectra and Structure.* Molecular spectra from the viewpoint of quantum mechanics during the analysis of electronic, vibrational and rotational spectra of polyatomic molecules and the use of group theory to simplify the calculations. Prerequisite: PH 471. Credit, 3 hours each semester.

576, 577 *Quantum Theory.* Quantum theory formulated in Hilbert space; observables and their corresponding operators, eigenstates and eigenvalues; quantum dynamics; approximation methods; systems of identical particles; angular momentum and group representation theory; collision processes; relativistic quantum theory. Prerequisites: PH 471, 522. Credit, 3 hours each semester.

578, 579 *Advanced Quantum Theory.* Relativistic one-particle equations, Klein-Gordon equation, Dirac equation, second quantization, theory of scattering, S-matrix, Feynman diagrams, quantum electrodynamics, renormalization procedures. Prerequisite: PH 577. Credit, 3 hours each semester.

580 *Current Topics in Solid State Physics.* Prerequisite: Approval of instructor. Credit, 1 hour.

581 *Solid State Physics.* Quantum theory of solids including phonons, lattice specific heats, band structure models, Fermi surfaces, thermal expansion, plasmons, electron-phonon interactions and scattering by lattice defects. Prerequisites: PH 481 or 482, 577. Credit, 3 hours.

582 *Solid State Physics.* Elements of transport theory, thermal conduction, electronic conduction in metals, mobility in semiconductors, Hall effect, magnetoresistance and selected topics of current research. Prerequisite: PH 581. Credit, 3 hours.

POLITICAL SCIENCE

PROFESSORS WHITE (SS 416), ALISKY, DURHAM, HINK, MASON, PEEK, RICE UHL; ASSOCIATE PROFESSOR KAMINSKY; ASSISTANT PROFESSORS AL-MARAYATI, DALGLEISH, GOODALL, VICHULES

DEPARTMENTAL MAJOR REQUIREMENTS—

BACHELOR OF ARTS DEGREE CURRICULUM

POLITICAL SCIENCE—consists of 45 semester hours of credit of which 30 must be in political science and 15 in closely related fields to be approved by the adviser in consultation with the student. Courses PS 100, 200, 250 or 260, one course in political theory (440, 441 or 442)', and 498 are required. The remaining 12 hours in political science must be selected from courses in the 400 series. At least 18 hours must be in upper division courses.

DEPARTMENTAL MAJOR TEACHING FIELD REQUIREMENTS—

BACHELOR OF ARTS IN EDUCATION DEGREE CURRICULUM

POLITICAL SCIENCE—consists of 45 semester hours of credit. Courses PS 100, 200, one course in political theory (440, 441 or 442), 411, and 480 are required. An additional 28 hours, 12 of which must be in political science and 16 in closely related fields, will be approved by the adviser in consultation with the student.

DEPARTMENTAL GRADUATE PROGRAMS—

The Department of Political Science offers programs leading to the degrees of Master of Arts and Master of Public Administration. Consult the Graduate Catalog for requirements.

POLITICAL SCIENCE

PS 100 *Government and Politics.* The major philosophies and institutions of modern government. Illustrative material is derived primarily from American government. Two lectures, 2 discussions. Credit, 4 hours.

200 *Problems of American Government.* The powers, functions, and agents of American political institutions. Prerequisite: PS 100. Two lectures, 2 discussions. Credit, 4 hours.

250 *Comparative Government.* The comparative study of political systems with emphasis on Britain, France, Germany, and Russia. Prerequisite: PS 100. Two lectures, 2 discussions. Credit, 4 hours.

260 *International Relations.* An introduction to contemporary international affairs through surveying the major problems in each of the important geographic regions. Prerequisite: PS 100. Two lectures, 2 discussions. Credit, 4 hours.

310 *Federal Constitution and Government.* The Constitution and government of the United States at the national level. Not open to students having credit for PS 100 or any course in U. S. national government. Meets the federal government requirement for teacher certification. Credit, 2 hours.

311 *Arizona Constitution and Government.* The Constitution and government of the State of Arizona. Not open to students having credit for a course in Arizona government. Meets the Arizona government requirement for teacher certification. Credit, 1 hour.

312 *National and Arizona Governments.* The constitutions and governments of the United States and Arizona. Not open to students having credit for PS 100 or any course in U.S. national and Arizona governments. Meets the federal and Arizona government requirements for teacher certification. Credit, 3 hours.

410 *Municipal Government.* The politics and administration of city and town government in the United States. Problems, forms, and services of city governments. Prerequisite: Eight hours in political science or approval of instructor. Credit, 3 hours.

411 *State Government.* Major problems of state government, including constitutional revision, governmental reorganization, legislative apportionment, and other matters. Special attention to Arizona government. Prerequisite: Eight hours in political science or approval of instructor. Credit, 3 hours.

412g *Metropolitan Governments.* The governments and politics of metropolitan areas. Prerequisite: Eight hours in political science or approval of instructor. Credit, 3 hours.

413g *The Legislative Process.* The lawmaking process followed in selected legislative bodies; composition of membership, organization, powers; impact of internal and external forces on legislation. Prerequisite: Eight hours in political science or approval of instructor. Credit, 3 hours.

420 *Public Administration.* Administration of public services; organization and procedure in theory and practice; dynamics of public management; politics and administration; bureaucracy. Prerequisite: Eight hours in political science or approval of instructor. Credit, 3 hours.

421 *Functions of Public Administration.* Personnel, finance, organization, and methods. Prerequisite: Eight hours in political science or approval of instructor. Credit, 3 hours.

422g *Problems in Public Administration.* Management problems in public agencies and the organization and methods techniques used to solve them. Prerequisite: Eight hours in political science or approval of instructor. Credit, 3 hours.

430 *Political Parties.* Development of the American party system. Party organization and functions. Prerequisite: Eight hours in political science or approval of instructor. Credit, 3 hours.

431g *Public Opinion and Propaganda.* The formation, expression, and influence of individual and organized opinion on political institutions. Prerequisite: Eight hours in political science or approval of instructor. Credit, 3 hours.

432g *Political Behavior.* An examination of political men, institutions, and activities using behavioral techniques. Equal emphasis is given to substantive findings and to methods of research. Prerequisite: Eight hours in political science or approval of instructor. Credit, 3 hours.

433g *Pressure Groups.* The aims, techniques, and influence of interest groups in American politics. Prerequisite: Eight hours in political science or approval of instructor. Credit, 3 hours.

434g *Problems in Comparative Politics.* The comparative study of political institutions, cultures, and styles. Prerequisite: Eight hours in political science or approval of instructor. Credit, 3 hours.

440 *Western Political Thought.* Western political philosophers and their theories from Plato and Aristotle to the 18th century. Prerequisite: Eight hours in political science or approval of instructor. Credit, 3 hours.

441g *Recent Political Thought.* Political ideas and philosophies from the 18th century to the present. Prerequisite: Eight hours in political science or approval of instructor. Credit, 3 hours.

442g *American Political Thought.* Political theories and movements from the colonial period to the present. Prerequisite: Eight hours in political science or approval of instructor. Credit, 3 hours.

450g *Government of the Soviet Union.* A descriptive and comparative analysis of Soviet government and institutions. Appraisal of the Soviet economic system and incentives, and of the machinery for control of the people. Prerequisite: Eight hours in political science or approval of instructor. Credit, 3 hours.

451g *Governments of Eastern Europe.* The governments and politics of Eastern European nations. Prerequisite: Eight hours in political science or approval of instructor. Credit, 3 hours.

452g *Governments of the Far East.* The governments and politics of the nations of South and East Asia. Prerequisite: Eight hours in political science or approval of instructor. Credit, 3 hours.

453g *Governments of Latin America.* The development and problems of national Latin American governments and international relations. Prerequisite: Eight hours in political science or approval of instructor. Credit, 3 hours.

454g *Government of Mexico.* Mexican federal, state, and local governmental institutions. Prerequisite: Eight hours in political science or approval of instructor. Credit, 3 hours.

460 *World Politics.* The development of the modern system of nation-states. Power politics. Role of international law. Prerequisite: Eight hours in political science or approval of instructor. Credit, 3 hours.

461g *American Foreign Policy.* The United States in world affairs. American foreign policy since World War I. The techniques involved in formulating American foreign policies. Prerequisite: Eight hours in political science or approval of instructor. Credit, 3 hours.

462g *International Relations of the Communist World.* The nature and objectives of the foreign policy of the Communist camp, with primary emphasis upon Soviet foreign policy and the Sino-Soviet conflict. Prerequisite: Eight hours in political science or approval of instructor. Credit, 3 hours.

463g *Inter-American Relations.* The diplomatic relations among the Latin American states. Development of U.S. foreign policy toward Latin America. Prerequisite: Eight hours in political science or approval of instructor. Credit, 3 hours.

465g *International Organizations.* Collective security as a means of maintaining world peace. Aims and accomplishments of the League of Nations, the United Nations, and other world organizations. Prerequisite: Eight hours in political science or approval of instructor. Credit, 3 hours.

470g *Constitutional Law.* Development of the United States Constitution as reflected in decisions of the Supreme Court: Jurisdiction and organization of the Federal courts; judicial review; separation of powers; federalism; the commerce clause; national taxing and spending power; state police power. Prerequisite: Eight hours in political science or approval of instructor. Credit, 3 hours.

471g *Constitutional Law.* Development of the United States Constitution as reflected in decisions of the Supreme Court: Due process; equal protection of laws; individual rights; civil liberties. Prerequisite: Eight hours in political science or approval of instructor. Credit, 3 hours.

472g *International Law.* The law of the nations as developed by custom and agreement and as exhibited in decisions of international and national tribunals. Prerequisite: Eight hours in political science or approval of instructor. Credit, 3 hours.

473g *Administrative Law.* Nature, sources, and scope of administrative law; government agencies and personnel; internal remedies and judicial control of administrative action. Prerequisite: Eight hours in political science or approval of instructor. Credit, 3 hours.

480g *Methods of Teaching Government.* Methods of instruction, organization, and presentation of subject matter in political science. Prerequisite: 2-SE 311 or concurrently, and 15 hours in political science or approval of instructor. Credit, 3 hours.

498g *Pro-Seminar.* Discussion of recent trends and developments in various fields of political science; group study and research for senior political science majors. Prerequisite: Political science major or approval of instructor. Credit, 3 hours.

520 *Municipal Management.* Management practices in cities and towns in the United States. Attention given to formal and informal organization structure and management practices, with a definite examination of management tools. Credit, 3 hours.

521 *Organizational Theory.* Organization theories and their application to administrative organizations at the national, state, and municipal levels of government. Credit, 3 hours.

522 *Governmental Budgeting and Finance Administration.* The legal and social nature of governmental budgets. Budgetary procedures and administrative methods of financial control through the devices of allotments, allocations, accounting, and reporting. Credit, 3 hours.

523 *Public Personnel Administration.* History of civil service, comparison of the older civil concept with the recent concept of the merit system. Problems of recruitment, examination preparation, pay scales, promotion, employee motivation, discipline. Credit, 3 hours.

524 *The Regulatory Process.* The role of federal and state agencies in regulating economic activity; transportation, electrical utilities, communications, anti-monopoly, agriculture, level of economic activity. Credit, 3 hours.

525 *Comparative Administration.* Administrative organization and process in selected foreign governments. The cultural basis of administrative systems. Credit, 3 hours.

526 *Internship in Government.* Required of all Master of Public Administration candidates without previous experience in government service. An internship to be served in an agency of federal, state, or local government. Credit, 3 hours.

591 *Seminar.* Topics will be selected from the following:
- (a) *American Government.* Credit, 3 hours.
- (b) *Politics.* Credit, 3 hours.
- (c) *Public Law.* Credit, 3 hours.
- (d) *Comparative Government.* Credit, 3 hours.
- (e) *International Relations.* Credit, 3 hours.
- (f) *Public Administration.* Credit, 3 hours.
- (g) *Political Theory.* Credit, 3 hours.

PSYCHOLOGY

PROFESSORS BACHRACH (SS 321G), BALL (Emeritus), GOLDIAMOND, GREENSPOON, GURNEE, KELLER, MEYERSON, A. STAATS; ASSOCIATE PROFESSORS BARDRICK, BROWNSTEIN, COPPOCK, MICHAEL, SHERMAN, C. STAATS, VERHAVE; ASSISTANT PROFESSORS GERSTEN, SUTTON, TAYLOR

DEPARTMENTAL MAJOR REQUIREMENTS—

BACHELOR OF ARTS DEGREE CURRICULUM

PSYCHOLOGY—consists of 45 semester hours of which 28 must be in psychology and 17 in related courses to be approved by the adviser in consultation with the student. Required courses in psychology are PY 112, 330; one course from among PY 240, 341, 342; PY 350 or 366, 424, 426, 320 and one other course from the general behavior theory area (PY 321, 322, 323, 421, 423). Required related courses are CH 113; MA 141 or PH 111; ZO 360; AN 111 or SO 101; PI 101. At least 18 semester hours must be in upper division courses.

BACHELOR OF SCIENCE DEGREE CURRICULUM

PSYCHOLOGY—consists of at least 47 semester hours of which 31 must be in psychology and a minimum of 16 hours in one of three options, to be approved by the adviser in consultation with the student. Required courses in psychology are PY 112, 330; one course from among PY 240, 341, 342; PY 350 or 366, 424, 426, 320, 323, and one other course from the general behavior theory area (PY 321, 322, 421, 423). Eight semester hours of a foreign language must be completed. At least 18 semester hours must be in upper division courses.

DEPARTMENTAL GRADUATE PROGRAMS—

The Department of Psychology offers programs leading to the degrees of Master of Arts and Doctor of Philosophy. Consult the Graduate Catalog for requirements.

PSYCHOLOGY

PY 100 *Elementary Psychology.* An introduction to psychology. No credit for psychology majors. Credit, 3 hours.

112 *General Psychology.* The basic principles of behavior. Required of all psychology majors. Three lectures, 2 hours laboratory. Credit, 4 hours.

240 *Human Growth and Development.* Growth and development throughout the life span. Prerequisites: PY 112; AN 111 or SO 101. Credit, 3 hours.

270 *Mental Health.* Principles and practices of mental health derived from clinical and experimental research. Credit, 3 hours.

315 *Psychology of Personality.* Definition and description of personality in terms of differing methodological approaches. Biological and sociocultural determinants of personality. Prerequisite: PY 112. Credit, 3 hours.

320 *Analysis of Behavior.* The methods and concepts of experimental

research with lower animals and humans. Training in digital logic control equipment. Prerequisite: PY 112. Not open to freshmen. Three lectures, quiz section, 4 hours laboratory. Credit, 4 hours.

321 *Human Learning.* Extension of experimentally established behavior principles to complex human learning. Prerequisite: PY 112. Two lectures, 2 hours laboratory. Credit, 3 hours.

322 *Conditioning.* Drive and reinforcement factors in conditioning. Classical conditioning of visceral and motor responses. Prerequisite: PY 112. Two lectures, 2 hours laboratory. Credit, 3 hours.

323 *Perception and Stimulus Control.* Discriminative processes, psychophysics, and signal detection theory. Prerequisites: PY 112, 320. Two lectures, 3 hours laboratory. Credit, 3 hours.

330 *Statistical Methods.* Application of statistics to psychology. Prerequisites: PY 112; MA 117, 118 or 141. Three lectures, 2 hours laboratory. Credit, 4 hours.

341 *Child Psychology.* Child behavior analyzed in terms of psychological principles. Evaluation of data from laboratory and clinic approaches. Prerequisite: PY 112. Credit, 3 hours.

342 *Psychology of Adolescence.* Methods and findings of recent studies of the development, growth and problems of the adolescent with implications for education. Prerequisites: PY 112 and 240 or 341. Credit, 3 hours.

350 *Social Psychology.* The behavior of man in his social relations. Problems of individual interaction in the group. Prerequisite: PY 112. Credit, 3 hours.

366 *Psychopathology.* Study of abnormal behavior. Prerequisite: PY 112. Credit, 3 hours.

380 *Applied Psychology.* Application of psychological principles and procedures to various settings and problems. Prerequisite: PY 112. Credit, 3 hours.

414 *History of Psychology.* The development of psychology from its beginnings to the present. Prerequisites: PY 320, 426. Credit, 3 hours.

421 *Child Behavior.* Laboratory studies of child behavior. Prerequisites: PY 112, 240 or 341. Two lectures, 2 hours laboratory. Credit, 3 hours.

423 *Comparative Psychology.* The generality of behavioral laws throughout the animal kingdom, as well as behaviors specific to different species. Prerequisite: PY 320. Two lectures, 3 hours laboratory. Credit, 3 hours.

424 *Physiological Variables.* Physiological variables in the control of behavior. Prerequisite: PY 320. Two lectures, quiz section, 3 hours laboratory. Credit, 4 hours.

425g *Physiological Psychology.* Application of combined methods from psychology and physiology to the analysis of behavior. Individual participation in projects investigating specific topics in physiological psychology. Prerequisite: PY 424. Two lectures, 3 hours laboratory. Credit, 3 hours.

426 *Theories of Learning.* Contemporary theories and systems in human and animal learning. Prerequisite: PY 320. Credit, 3 hours.

429g *Behavioral Pharmacology.* The problems and methods of drug research from the standpoint of experimental psychology. Prerequisite: PY 424. Credit, 3 hours.

440g *Directed Experience With Children.* Special studies adapted to the needs of the student including experience with play therapy when the student has sufficient background to participate in this program. Prerequisite: Approval of instructor. Credit, 3 hours.

498g *Pro-Seminar.* The following topics are regularly offered by the Department:

(a) *Neuroanatomy.* Credit, 3 hours.
(b) *Neurophysiology.* Prerequisite: Neuroanatomy. Credit, 3 hours.
(c) *Neuropharmacology.* Prerequisite: PY 424. Credit, 3 hours.
(d) *Biological Bases of Behavior.* Prerequisite: PY 424. Credit, 3 hours.

512 *Systems and Theories of Psychology.* Historical development of contemporary systems and theories. Prerequisite: Nine hours in psychology. Credit, 3 hours.

520 *Advanced Experimental Analysis of Behavior.* Contemporary research literature in the experimental analysis of behavior. Prerequisite: PY 320. Credit, 3 hours.

521 *Human Learning.* Research methods and findings in human motor and verbal learning. Prerequisite: PY 321. Credit, 3 hours.

522, 523 *Methods in Experimental Psychology.* The basic procedures and equipment used in the psychological laboratory. Prerequisite: Approval of instructor. Credit, 3 hours each semester.

524 *Advanced Physiological Psychology.* Theories of physiological mechanisms and brain function in behavior. Prerequisite: PY 424 or Pro-seminar in Neuroanatomy and Neurophysiology. Credit, 3 hours.

525 *Language Processes.* Theoretical and experimental analysis of language behavior. Prerequisite: PY 321. Credit, 3 hours.

526 *Advanced Learning.* Advanced formulations and procedures in learning and conditioning. Prerequisites: PY 320, 426. Credit, 3 hours.

528 *Sensory Processes.* Psychophysics, signal detection, communication, and information theory. Prerequisites: PY 323, 424. Credit, 3 hours.

530 *Intermediate Statistics.* Application of statistics to psychology with emphasis on statistical inference and experimental design. Prerequisites: PY 330; MA 117, 118. Two lectures, 3 hours laboratory. Credit, 3 hours.

533 *Quantitative Methods in Psychology.* Logic, procedures, and problems of psychological measurement. The nature of variables, functional relations, scaling, curve fitting, reliability and validity as used in psychological research and testing. Prerequisite: PY 330. Credit, 3 hours.

540 *Developmental Psychology.* Basic principles, data and methods in the study of human development. Prerequisite: PY 240 or 341 or 342. Credit, 3 hours.

550 *Advanced Social Psychology.* Advanced study of the relationships between individuals and social groups. Prerequisite: PY 350. Credit, 3 hours.

558 *Group Dynamics.* Theories and methods of study of group leadership, group effectiveness, communication within groups, and relations between groups and individual members. Prerequisite: PY 350. Credit, 3 hours.

560 *Diagnostic Methods.* Diagnostic instruments including intelligence, objective and projective tests. Prerequisite: PY 500. Two lectures, 2 hours laboratory. Credit, 3 hours.

562 *Projective Testing.* Administration, scoring and interpretation of the Rorschach. Prerequisite: PY 560. Credit, 3 hours.

563 *Projective Testing.* Administration and interpretation of projective tests, with special emphasis on the TAT. Prerequisite: PY 560. Credit, 3 hours.

566 *Individual Psychotherapy.* Theories and techniques of psychotherapy. Prerequisite: Approval of instructor. Credit, 3 hours.

567 *Group Psychotherapy.* Theories and techniques of group psychotherapy. Prerequisite: Approval of instructor. Credit, 3 hours.

568 *Play Therapy.* Methods and theories of play therapy with parallel supervised laboratory, experiences in play therapy. Conferences with parents and teachers. Prerequisite: Approval of instructor. Two lectures, 2 hours laboratory. Credit, 3 hours.

570 *Theories of Personality.* The theories of personality which are of current significance in psychology. Prerequisite: PY 315. Credit, 3 hours.

571 *Advanced Psychopathology.* The major neurotic and psychotic symptoms and syndromes. Prerequisites: PY 366, 315 or 570. Credit, 3 hours.

572 *Experimental Foundations of Clinical Psychology.* The contributions of experimental methods to clinical psychology. Fundamentals of general-experimental psychology underlying clinical practice. Prerequisite: PY 320. Credit, 3 hours.

576 *Clinical Neurology.* Clinical syndromes involving neurological pathology. Prerequisite: PY 424 or equivalent. Credit, 3 hours.

580 *Behavioral Engineering.* Systems theory, cybernetics, and the experimental analysis of behavior. Prerequisites: PY 320 and approval of instructor. Credit, 3 hours.

581 *Evaluation of Abnormal Behavior.* Methods of measuring critical constructs of psychopathology, e.g., intelligence, personality, anxiety, attitudes, etc., including the theoretical bases of the constructs. Prerequisite: Ph.D. core program. Credit, 3 hours.

582, 583 *Development of Abnormal Behavior.* Research methodologies and data of various disciplines, including anthropology, genetics, biochemistry, neurology, physiology, and psychology, relative to the development and persistence of psychopathology. Prerequisite: PY 581 or concurrently. Credit, 3 hours each semester.

584, 585 *Modification of Abnormal Behavior.* Theory and methods used in modifying the abnormal behavior of children, adolescents, adults, and the aged, including the physically and mentally handicapped. Prerequisites: PY 581, 582, 583. Credit, 3 hours each semester.

586, 587 *Somatopsychology.* Fact and theory in the psychological aspects of chronic illness, physical disability, and mental retardation. Prerequiiste: Ph.D. core program. Credit, 3 hours each semester.

GRADUATE SCHOOL OF SOCIAL SERVICE ADMINISTRATION

PROFESSORS LUNDBERG (SS 224D), MECH; ASSOCIATE PROFESSORS BOYER, CRANMER, MCCANN

SW 601 *Social Work in American Society.* The social work profession's purposes, assumptions, values and responsibilities. Historical antecedents provide perspective to the study of social work, its professional associations and education. Credit, 1 hour.

602 *Social Services and Policy I.* Historic antecedents and current programs designed to meet social needs. Comparative analysis of social welfare services and policy among Western societies. The functions of professions and their evolution in a changing society. Social, political and economic forces affecting the development of social services. Credit, 2 hours.

603 *Social Services and Policy II.* Issues in social welfare problem, policy and provision in the framework of current programs. History of philosophical and social work principles and concepts are considered and related to Phoenix and Arizona public and private agencies. Credit, 2 hours.

610, 611 *Human Behavior and the Social Environment I-II.* Normal behavior and social functioning of the infant, child, pre-adolescent, adolescent, mature and senescent individual as it is affected by the factors of: culture; physical, intellectual, and emotional endowment and development; spiritual involvement; and group relationships. Credit, 4 hours for the first semester, 2 hours for the second semester.

615, 616 *Social Casework I-II.* Components of the casework method. Basic principles of casework practice, the structure of the problem solving process, the nature and uses of the professional relationship, the identification, assessment and treatment of problems of social functioning and use of the social agency in the problem solving process. Credit, 2 hours each semester.

620 *Dynamics of Group Process.* Dynamics of groups: roles, ascribed status to members, leadership. Beginning knowledge of the theoretical aspects of group behavior. Credit, 2 hours.

625 *Community Organization.* Components of the community organization method in social work practice: the nature of the clientele and problems to which the method is directed. The programs, organizing principles, and concepts that are characteristic of community organization practice. Credit, 2 hours.

630 *Statistical Analysis in Social Work.* Application of quantitative methods of analysis to social work data. Topics include descriptive statistics, normal curve, t-test, correlation analysis, and Chi-square. Interpretation of data is emphasized. One lecture, one hour computational laboratory. Credit, 1 hour.

631 *Research Methods in Social Work.* Methodology in social and behavioral research. Emphasis on problem formulation, hypothesis development, and methods of devising representative designs in social work research. Credit, 2 hours.

640, 641 *Field Instruction.* Individual instruction, social work practice in a qualified agency: experience in the disciplined use of self in a professional helping relationship, in a method of social work practice (i.e., casework, group work, or community organization). Two consecutive semesters in the same agency. Credit, 4 hours each semester.

650 *Social Services and Policy III.* Agency focused study of social services and structure in medical, correctional, public school and social welfare agencies. Existing organization patterns are contrasted with the "ideal". Credit, 2 hours.

651 *Social Issues, Problems, and Policy.* Contemporary social issues, problems and relevant present or potential policy. Relationship of these to the social work profession: educationally; in its membership associations; and to social work practice. Credit, 2 hours.

655 *Social Welfare Administration.* Administrative structure of social agencies and aspects of the social worker's job. Administration as a process. Responsibilities in being an employee, staff member, agency representative, supervisee, colleague, and citizen. Credit, 2 hours.

660, 661 *Human Behavior III-IV (Pathology).* Knowledge of human behavior with particular attention to abnormal social functioning and entities of pathological behavior. Deviant behavior is related to its origin in the various stages of psychosexual development. Credit, 2 hours each semester.

665, 666 *Social Casework III-IV.* Prerequisites: SW 615, 616. Application of casework principles and techniques to more complex problems of social functioning, collaborative relationships and secondary practice settings. Credit, 2 hours each semester.

675, 676 *Community Organization Practice I-II.* Community organization method: an analysis of the means of identifying and assessing social welfare problems and the planning related to the development of social services as these are carried out in both primary and secondary community organization agencies. A two semester sequence open to students in the community organization concentration. Credit, 2 hours each semester.

680, 681 *Field Research.* Concurrent seminar and practicum with emphasis on the applications of research strategies to social work practice. Completion of a practice based study is required. Students will participate in a cooperative project or may, with faculty approval, elect the option of an individual project. Credit, 2 hours each semester.

683 *Advanced Statistical Methods.* Theory of multivariate methods of analysis with application to social work data. Topics include analysis of variance, covariance, trend analysis, and advanced correlational methods. Prerequisites: SW 630 or equivalent. Credit, 2 hours.

690 Reading and Conference.

693, 694 *Field Instruction.* Individual instruction, social work practice in a qualified agency: a continuation of SW 640, 641 in a different type of agency. Two consecutive semesters in the same agency. Credit, 6 hours each semester.

729 *Educational Aspects of Field Instruction.* Theory underlying field instruction, concurrent to the student's first semester as a Field Instructor for the School. Prerequisite: Masters degree in social work and instructor's approval. Credit, 2 hours — open for audit.

SOCIOLOGY

PROFESSOR HOULT (SS 107E); ASSOCIATE PROFESSORS
GARABEDIAN, GUILLOT, HARWARD, HUDSON, LINDSTROM,
MANHEIM, OWEN; ASSISTANT PROFESSORS
KUNKEL, MARIS, SEBALD

DEPARTMENTAL MAJOR REQUIREMENTS—
BACHELOR OF ARTS DEGREE CURRICULUM

SOCIOLOGY—consists of 45 semester hours of credit of which 30 must be in sociology and 15 in closely related fields to be approved by the adviser in consultation with the student. The 30 hours must include SO 101 or 301, 390, 403, 490, and at least one course from each of the following areas: Demography and ecology, social organization, social problems, and social psychology. At least 18 semester hours must be in upper division courses.

BACHELOR OF SCIENCE DEGREE CURRICULUM

SOCIOLOGY—consists of 45 semester hours of credit of which 30 must be in sociology and 15 in closely related fields to be approved by the adviser in consultation with the student. The 30 hours must include SO 101 or 301, 390, 403, 490, and at least one course from each of the following areas: Demography and ecology, social organization, social problems, and social psychology. At least 18 semester hours must be in upper division courses.

A social welfare emphasis is available for interested students in either the Bachelor of Arts or Bachelor of Science major in sociology. The program requires, in addition, SO 371, 372, and 478, with other courses in related fields approved by the adviser in consultation with the student.

DEPARTMENTAL GRADUATE PROGRAMS—

The Department of Sociology offers programs leading to the degree of Master of Arts. Consult the Graduate Catalog for requirements.

SOCIOLOGY

SO 101 *Introductory Sociology.* The fundamentals of sociology, organization of human groups and society, and the processes of interaction and social change. Credit, 3 hours.

171 *Social Welfare.* Observation and analysis of community welfare services. Two lectures, 3 hours field trips and discussion. Credit, 3 hours.

231 *The Community.* The development and organization of institutions in human communities of various types. Prerequisite: SO 101. Credit, 3 hours.

251 *American Society.* Systematic analysis of the major institutions of

economic activity, political structure, science, education and religion in contemporary America. Prerequisite: SO 101. Credit, 3 hours.

301 *Principles of Sociology.* Intensive and critical analysis of the concepts of sociology. Not open to students who have credit for SO 101. Credit, 3 hours.

332 *The Modern City.* The growth, characteristics, and problems of the modern city. Prerequisite: SO 101 or 301. Credit, 3 hours.

333 *Population Problems.* Theories of population change; births, death, migration; population policies. Prerequisite: SO 101 or 301. Credit, 3 hours.

341 *Modern Social Problems.* Race relations, poverty, unemployment, and other current issues. Credit, 3 hours.

345 *Society and Juvenile Delinquency.* Delinquency viewed as a product of the society; the societal factors of apprehension, treatment, and prevention. Prerequisite: SO 101 or 301. Credit, 3 hours.

351 *Industrial Sociology.* Social and cultural analysis of industry. Attention given to occupational roles, status, and social participation of workers. Prerequisite: SO 101 or 301. Credit, 3 hours.

352 *Social Change.* Patterns of social change, resistance to change, and change-producing agencies and processes. Prerequisite: SO 101 or 301. Credit, 3 hours.

355 *Courtship and Marriage.* A functional approach to marriage; courtship, engagement, marital adjustment. Credit, 3 hours.

360 *The Social System and the Individual.* Interaction patterns between the sociocultural order and individuals; socialization process; norms, roles, and statuses; collective behavior. Prerequisite: SO 101 or 301. Credit, 3 hours.

362 *Sociology of Adolescence.* Cultural values and the social processes that help explain the development of the phenomenon of modern adolescence, including investigation of adolescent subcultures and cross-cultural references. Prerequisite: SO 101 or 301. Credit, 3 hours.

371, 372 *Social Welfare as a Social Institution.* The development of social welfare as an institution meeting changing human needs and system needs; analysis of present-day philosophy and function. Prerequisites: Six hours in sociology including SO 101 or 301, or approval of instructor; 371 prerequisite for 372. Credit, 3 hours each semester.

390 *Social Statistics.* Application of statistical methods to research problems in sociology: problems of scale-construction, measures of central tendency and variability, simple relationship statistics, sampling, and presentation of data. Prerequisite: SO 101 or 301. Credit, 3 hours.

403g *History of Social Thought.* Social thought in human culture. The background of modern sociology. Prerequisites: Six hours in sociology including SO 101 or 301, or approval of instructor. Credit, 3 hours.

432g *Human Ecology.* The patterns and laws of societies' adjustments to the physical environment; the distribution of communities and institutions. Prerequisites: Six hours in sociology including SO 101 or 301. Credit, 3 hours.

433g *Demography.* The science of population analysis; problems in measurement of the size, composition and changes in population. Prerequisites: Six hours in sociology including SO 101 or 301, or approval of instructor. Credit, 3 hours.

446g *Principles of Criminology.* Causation of crime; juvenile delinquency; classes of crime; criminal as a social type. Prerequisites: Six hours in sociology including SO 101 or 301, or approval of instructor. Credit, 3 hours.

447g *Penology.* Theories of punishment; methods of dealing with convicts; police, courts, prisons, probation, and parole. Prerequisites: Six hours in sociology including SO 101 or 301, or approval of instructor. Credit, 3 hours.

448g *Gerontology.* The social processes in aging and their relationship to the physical changes. Prerequisites: Six hours in sociology including SO 101 or 301, or approval of instructor. Credit, 3 hours.

451g *Sociology of Occupations and Professions.* The rise of occupational groups and professions, their role in modern societies, and their impact on the development of newly industrializing nations. Prerequisites: Six hours in sociology including SO 101 or 301, or approval of instructor. Credit, 3 hours.

452g *Sociology of Complex Organizations.* Sociological studies of government agencies, industrial firms, labor unions, military establishments, and other large-scale organizations. Prerequisites: Six hours in sociology including SO 101 or 301, or approval of instructor. Credit, 3 hours.

453g *Social Class and Stratification.* Social classes and the function of these groupings in a society. Prerequisites: Six hours in sociology including SO 101 or 301, or approval of instructor. Credit, 3 hours.

455g *The Family.* The family considered from the institutional viewpoint, its historical development, and its adaptation to a changing culture; the family system in many cultures. Prerequisites: Six hours in sociology including SO 101 or 301, or approval of instructor. Credit, 3 hours.

456g *Marriage Problems in Contemporary Society.* Marital and family problems in today's society from the viewpoint of personal and cultural adjustment. Prerequisites: Six hours in sociology including SO 101 or 301, or approval of instructor. Credit, 3 hours.

462g *Social Control.* The significance of social control in society, and the various methods used by individuals and groups to control others. Prerequisites: Six hours in sociology including SO 101 or 301, or approval of instructor. Credit, 3 hours.

463g *Small Group Interaction.* Theoretical and applied aspects of social interaction, with particular emphasis on the processes involved in small groups. Prerequisites: Six hours in sociology including SO 101 or 301, or approval of instructor. Credit, 3 hours.

464g *Role Theory.* Current theory and research on social roles, role-taking, role-playing, and the bearing of individual role-behavior on the structure of groups and society. Prerequisites: Six hours in sociology including SO 101 or 301, or approval of instructor. Credit, 3 hours.

470g *Community Resources.* Existing social agencies; the needs they meet and how they meet them. Especially designed for teachers, nurses, police, and related professions. Prerequisite: Approval of instructor. Credit, 3 hours.

478g *Social Work as a Profession.* The development of the profession of social work; the philosophical and scientific basis for its practice. Prerequisites: SO 371, 372, or approval of instructor. Two lectures, regularly-scheduled limited experience in a social agency. Credit, 3 hours.

490g *Social Research.* The methods of sociological research, including the fundamental assumptions underlying research, and some practical experience in research design, data collection techniques, and data analysis. Prerequisites: SO 101 or 301, 390, or approval of instructor. Credit, 3 hours.

491g *Community Surveys and Analysis.* The application of sample survey methods to the study of communities and large-scale organizations. Analysis of community problems through an actual field study. Prerequisites: SO 101 or 301, 390, or approval of instructor. Credit, 3 hours.

494g *Intermediate Social Statistics.* Multivariate and correlational analysis as used in survey research, sociological experiments and field studies. Prerequisite: SO 390 or equivalent. Credit, 3 hours.

495g *Methodological Issues in Sociology.* Systematic examination of basic methodological issues in the application of scientific methods to the study of human social life. Emphasis placed on a limited number of major works, with contrasting approaches to the issues. Prerequisite: SO 490 or approval of instructor. Credit, 3 hours.

500 *Research Methods.* Credit, 3 hours.

505 *Contemporary Sociological Theory.* Nature and functions of modern sociological theory. Major theoretical approaches. Prerequisite: SO 403 or equivalent or approval of instructor. Credit, 3 hours.

506 *Current Sociology.* Contemporary issues in sociology; their implications for future research and theory. Prerequisite: Approval of instructor. Credit, 3 hours.

532 *Studies in Ecology and Demography.* Current literature in ecology and demography; group and individual projects. Prerequisites: SO 432, 433 or approval of instructor. Credit, 3 hours.

546 *Criminology and Criminal Law.* The history of criminal law and punishment as a means of social control; the use of indeterminate sentences, probation, and parole; the legal foundations of the juvenile court; the law of arrest, search, and seizure; and the role of psychiatry in criminal law. Prerequisite: Approval of instructor. Credit, 3 hours.

552 *Social Aspects of Economic Development.* Social prerequisites, concomitants, and effects of industrialization, and the evaluation of recent research in these areas. Prerequisite: Approval of instructor. Credit, 3 hours.

555 *Studies of the Family.* Current developments in the study of marriage and the family. Prerequisite: Approval of instructor. Credit, 3 hours.

561 *Small Group Experiments.* Methods used in studying small groups. Participation in the design and execution of experiments. Prerequisites: SO 463, 490. Credit, 3 hours.

591 *Seminar.* Topics will be selected from the following:

(a) *Ecology and Demography.* Credit, 3 hours.
(b) *Social Problems Theory.* Credit, 3 hours.
(c) *Social Organization.* Credit, 3 hours.
(d) *Social Psychology.* Credit, 3 hours.
(e) *Social Conflict.* Credit, 3 hours.
(f) *Philosophical Issues in Sociological Theory.* Credit, 3 hours.
(g) *Methodological Problems.* Credit, 3 hours.

SPEECH AND DRAMA

PROFESSOR Byers; ASSOCIATE PROFESSORS Davis, Stites, Yeater;
ASSISTANT PROFESSORS Cluff, Doyle, Pacilio,
Willson; INSTRUCTORS Hale, Griggs

DEPARTMENTAL MAJOR REQUIREMENTS—

BACHELOR OF ARTS DEGREE CURRICULUM

SPEECH—consists of 45 semester hours of which not less than 24 must be in speech courses and a minimum of 15 hours in a related area. Courses SE 120, 211, 241, 312, 313, 421, 424, and 450 are required. The remaining hours in speech and related areas are selected by the student in conference with his adviser. At least 18 hours must be in upper division courses.

DRAMA—consists of 45 hours of which 30 must be in drama and 15 in a related area. DR 111, 112, 213, 314, 315, and 320 are required. The remaining hours in drama and the related area are selected by the student in conference with his adviser. At least 18 hours must be in upper division courses.

BACHELOR OF SCIENCE DEGREE CURRICULUM

SPEECH CORRECTION—consists of 45 semester hours of which 27 must be in speech correction courses and 18 hours in related areas. Courses SE 120, 421, 423, 424, 427, 428, 430, and 431 are required. The remaining hours in speech correction and related areas are selected by the student in conference with his adviser. At least 18 hours must be in upper division courses.

DEPARTMENTAL MAJOR TEACHING FIELD REQUIREMENTS—

BACHELOR OF ARTS IN EDUCATION DEGREE CURRICULUM

SPEECH AND DRAMATICS—consists of 45 semester hours. SE 120, 211, 241, 312, 313, 421, 424, 450, and DR 111, 112, 213, and 315 are required. The remaining hours in speech or drama are selected by the student in conference with his adviser.

SPEECH AND SPEECH CORRECTION—consists of 45 semester hours. Courses SE 120, 211, 221, 241, 300 or 312, 421, 423, 424, 425, 426, 428, 430, 450 or 460 are required. The remaining hours in speech and speech correction are selected by the student in conference with his adviser.

DEPARTMENTAL GRADUATE PROGRAMS—

The Department of Speech and Drama offers programs leading to the degrees of Master of Arts and Master of Science. Consult the Graduate Catalog for requirements.

DRAMA

DR 111 *Introduction to Drama.* The various types of drama with reference to their theatric representation. Credit, 3 hours.

112 *Acting.* Reading in theory; laboratory projects. Credit, 3 hours.

113 *Make-up.* The techniques of theatrical make-up; laboratory projects. Credit, 3 hours.

212 *Intermediate Acting.* Theory and practice in improvisation, vocal and physical disciplines, realistic characterization. Prerequisite: DR 112 or approval of instructor. Credit, 3 hours.

213 *Stage Scenery.* Theory and practice of designing stage decor; laboratory projects. Two lectures, 6 hours laboratory. Credit, 4 hours.

311 *Creative Dramatics.* Theories, procedures, and materials for creative dramatics in the elementary and junior high schools. Consideration of related speech activities such as story telling, choral speaking, and puppetry. Credit, 3 hours.

312 *Children's Theater.* Acting, directing and producing techniques for child audiences. Includes participation in a children's theater production. Credit, 3 hours.

314 *Advanced Acting.* A history of the art of acting. Group participation in scenes from plays to illustrate the various styles of acting. Prerequisite: DR 212 or approval of instructor. Credit, 3 hours.

315 *Directing.* The principles of play direction; laboratory projects. Prerequisite: DR 213. Credit, 3 hours.

320 *History of the Theater.* A study of twenty plays to illustrate the art of theatric representation at successive stages in the evolution of the physical playhouse of the Western World. Credit, 3 hours.

330 *Theatrical Costume Design.* History of theatrical costume; laboratory projects in construction of costumes. Credit, 3 hours.

340 *Scene Design.* Theory and practice of scenery design for the theatre. Laboratory projects. Prerequisite: DR 213. Credit, 3 hours.

410g *Advanced Technical Practices.* Modern theories of theater production with laboratory projects. Credit, 3 hours.

411g *Advanced Studies in Creative Dramatics.* Application of theories, techniques and materials for dramatization. Two laboratory sessions weekly with children. Prerequisite: DR 311. Credit, 3 hours.

415g *Directing.* Aesthetic and technical theories of play direction, with laboratory projects in stylized and period plays. Prerequisite: DR 315. Credit, 3 hours.

520 *Historical Studies in the Theater Arts.* Detailed investigation of selected periods in the development of the theater arts. Credit, 3 hours.

591 *Seminar.* Topics will be selected from the following:

(a) *Theatre History and Criticism.* Credit, 3 hours.
(b) *Acting and Production.* Credit, 3 hours.
(c) *Technical Theatre Production.* Credit, 3 hours.
(d) *Children's Theatre and Creative Dramatics.* Credit, 3 hours.

See related course: MC 321 *Radio-Television Drama.*

SPEECH

SE 100 *Elements of Speech.* Adjustment to the speech situation; obtaining and organizing material. The conversational mode; articulation, pronunciation, and tone; bodily movement. Credit, 2 hours.

120 *Speech Fundamentals.* The physical and functional bases of speech production. Required of speech majors and minors. Credit, 2 hours.

211 *Public Speaking.* Organization and delivery of various types of speeches. Emphasis on types which occur most often in everyday life. Prerequisite: SE 100 or 120 or approval of instructor. Credit, 2 hours.

214 *Intercollegiate Debate.* Preparation for and participation in intercollegiate debates. Prerequisite: Approval of instructor. Credit, 2 hours.

221 *Voice and Diction.* Designed to develop and improve the speaking voice. Background discussion and individual and group exercises and drills. Prerequisite: SE 100 or 120. Credit, 2 hours.

241 *Oral Interpretation.* Techniques of the reading aloud of prose, poetry, and drama. Prerequisite: SE 100 or 120. Credit, 3 hours.

300 *Principles and Methods of Discussion.* The development of attitudes and skills for effective participation and leadership in discussion. Practice in symposiums, panels, and conferences. Prerequisite: Approval of instructor. Credit, 3 hours.

312 *Principles of Argumentation.* Construction and delivery of various types of argumentative speeches. Essential to students engaging in intercollegiate debate. Prerequisite: SE 100 or 120. Credit, 3 hours.

313 *Speech Composition.* Practice in the organization and compositional development of speeches. Prerequisite: SE 100 or 120. Credit, 3 hours.

315 *Intercollegiate Debate.* Prerequisite: SE 214. Credit, 2 hours.

316 *Intercollegiate Debate.* Prerequisite: SE 315. Credit, 2 hours.

341 *Advanced Oral Interpretation.* More technical study of the art of reading aloud effectively from prose, poetry, and drama. Prerequisite: SE 241. Credit, 3 hours.

411g *Business and Professional Speech.* The application of rhetorical principles to specific business and professional speaking situations. Practice in using the forms of persuasion, conference speaking techniques, and group participation methods. Credit, 3 hours.

420g *Speech Correction for the Classroom Teacher.* The role of the teacher in understanding and aiding speech and hearing development in normal and speech-defective children with emphasis upon the recognition and prevention of disorders. May not be counted toward the major in speech and drama. Credit, 3 hours.

421g *Speech Correction.* Cause and correction of disorders of speech. Credit, 3 hours.

422g *Speech Pathology.* The nature and treatment of major disorders of speech with emphasis upon aphasia, cerebral palsy, cleft palate, and stuttering. Prerequisite: SE 421 or approval of instructor. Credit, 3 hours.

423g *Clinical Practice in Speech Correction.* Case treatment of speech disorders in the University Speech Clinic. Prerequisite: SE 421. May be repeated for credit. Credit, 1-3 hours.

424g *Phonetics.* The science of speech sounds, and its application to the pronunciation of American speech. Credit, 2 hours.

425g *Audiology.* The normal process of hearing and the nature, causes, and rehabilitation of hearing disabilities. Credit, 3 hours.

426g *Audiometry.* Theory and practice of testing hearing acuity, and of evaluating and interpreting test results. Credit, 3 hours.

427g *Clinical Practice in Audiology and Audiometry.* Practical experience in testing and rehabilitating the hearing handicapped. Prerequisite: SE 425. May be repeated for credit. Credit, 1-3 hours.

428g *Speech Diagnostic Practicum.* Participation in the speech diagnosis division of the Speech and Hearing Clinic. Prerequisite: SE 421. May be repeated for credit. Credit, 1 hour.

429g *Organic Speech Disorders.* The nature and treatment of organic disorders of speech with emphasis on their neurological and medical aspects. Prerequisite: SE 421 or approval of instructor. Credit, 3 hours.

430g *Speech Science.* The anatomical and physiological mechanisms of speech and voice. Credit, 3 hours.

431g *Stuttering.* Causes, therapies, and current research trends. Prerequisite: SE 421. Credit, 3 hours.

432g *Lip Reading and Auditory Training.* Therapies and theories of lip reading and auditory training. Prerequisite: SE 425. Credit, 3 hours.

450g *Contemporary Public Address.* Leading contemporary public speakers and their influence on social and political life. Credit, 3 hours.

460g *American Public Address.* Survey and rhetorical evaluation of outstanding American speakers from the seventeenth century to the twentieth. Credit, 3 hours.

473g *Persuasion.* The study and practice of persuasive principles that influence and modify the belief and action of an audience. Prerequisite: SE 100 or 312. Credit, 3 hours.

480g *Methods of Teaching Speech and Drama.* Analysis, organization, and presentation of textual and other classroom materials. Credit, 3 hours.

575 *Speech Development in Children.* Patterns and processes in the development of language in children and methods of improving children's speech development. Credit, 3 hours.

591 *Seminar.* Topics will be selected from the following:

(a) *Rhetorical Theory.* Credit, 3 hours.
(b) *Persuasion.* Credit, 3 hours.
(c) *Speech Correction.* Credit, 3 hours.
(d) *Hearing.* Credit, 3 hours.

TECHNOLOGY

PROFESSORS BURDETTE (ITC 203), LITTRELL, KIGIN; ASSISTANT
PROFESSORS BOARD, BURK, CAVALLIERE, EDWARDS, KAUFMAN,
KEITH, PAXTON, PEABODY, PRUST; INSTRUCTORS
BAGLEY, FARNSWORTH

FIELDS OF SPECIALIZATION REQUIREMENTS—

The Division of Industrial Design and Technology offers fields of specialization in aeronautical technology, communication technology, design technology, electronic technology, graphic arts technology, tool and manufacturing technology, and welding technology.

DEPARTMENTAL MAJOR TEACHING FIELD REQUIREMENTS—

BACHELOR OF ARTS IN EDUCATION DEGREE CURRICULUM

INDUSTRIAL ARTS—consists of 45 semester hours of credit, of which 19 hours are required laboratory courses, 11 are required professional industrial arts courses, and 15 are selected from an area of specialization with the approval of the student's adviser.

AERONAUTICAL TECHNOLOGY

TA 180 *Aircraft and Aero-Space Structures.* Design considerations, construction, manufacturing techniques and processes. Two lectures, 4 hours laboratory. Credit, 3 hours.

181 *Aircraft and Aero-Space Maintenance.* Modern aircraft and space systems, hydraulics, electrical equipment, control systems, weight and balance, and inspection methods. Prerequisite: TA 180. Two lectures, 4 hours laboratory. Credit, 3 hours.

182 *Air Navigation.* Flight principles, charts and navigation problems, radio procedures, and pertinent Federal air regulations. Credit, 3 hours.

185 *Private Pilot Certificate.* Flight school primary. Flight training to meet FAA requirements. Satisfactory completion of FAA tests required for certification. Credit arranged; limit, 3 hours.

287 *Aircraft and Aero-Space Powerplants.* Theory of internal combustion engines, components, power curves, thrust, inspection, and processes. Two lectures, 4 hours laboratory. Credit, 3 hours.

288 *Aircraft and Aero-Space Powerplant Maintenance.* Theory and design, operation, inspection, engine installation, analysis of engine systems, and accessories. Prerequisite: TA 287. Two lectures, 4 hours laboratory. Credit, 3 hours.

300 *Aircraft Design.* Considerations, theory and concepts; stressed skin aircraft; missile and aero-space vehicles, correlation of design requirements with manufacturing practice. Prerequisites: TA 181, 288; PH 111, ME 230, ME 280. Credit, 2 hours.

306 *Aero-Space Electrical and Electronic Systems.* Theory, design, reliability requirements, manufacturing process, applications of complex electrical and electronics systems and instrumentation used in aircraft and aero-space vehicles. Prerequisites: TA 181, TA 288, TE 200. Two lectures. Credit, 2 hours.

307 *Aero-Systems Orientation.* Current and future aircraft, missile and aero-space systems. Purpose, cost analysis and performance evaluation. Credit, 2 hours.

308 *Combustion Analysis.* Principles of combustion systems, components, chemical and physical performance analysis of fuels and lubricants using standard ASTM Testing Methods. Prerequisites: TA 288; ME 280. Credit, 2 hours.

310 *Vertical Take-Off Aircraft.* History and development, performance, stability and control characteristics of vertical take-off and landing aircraft. Prerequisites: TA 181, TA 288. Credit, 2 hours.

384 *Airport Planning.* Community airway and traffic control; airport types, requirements, planning and construction; lighting, building and hangar design. Credit, 2 hours.

385 *Commercial Pilot Certificate.* Flight training to meet FAA requirements. Satisfactory completion of FAA tests required for certification. Prerequisite: TA 185. Credit, 2-8 hours.

388 *Propulsion.* Principles, thrust, performance, combustion systems, metallurgy, gas turbines, ram jets, rockets, and combustor design considerations. Prerequisite: TA 308. Two lectures, 3 hours laboratory. Credit, 3 hours.

389 *Aero-Space Manufacturing Analysis.* Analysis of product flow, industrial forecasting, planning, control, and methods. Prerequisites: TM 161; ME 230. Credit, 2 hours.

390 *Aero-Space System Analysis.* Theory, research and development methods, parameters comparative analysis, total system concept and evaluation. Prerequisite: TA 388. Credit, 2 hours.

486 *Flight Operations Management.* Fixed base operations and business flying; governmental regulations, aircraft sales policies and promotional methods. Credit, 2 hours.

487 *Aircraft and Aero-Space Design Data.* Analysis of design data for aircraft and aero-space vehicles; value analysis, production requirements and manufacturing techniques. Prerequisites: TA 300, TA 388, TA 389. Credit, 3 hours.

488 *Airline Management.* Administrative problems and airport management; unit organizations, personnel problems, interline agreements, promotion and publicity. Credit, 2 hours.

490 *Aero-Space System Analysis.* Research and development methods, feasibility, costs, and needs of present and future space systems; cost reduction, value analysis and methodology. Prerequisites: TA 300, TA 390. Credit, 3 hours.

DESIGN TECHNOLOGY

TD 111 *Technical Drawing.* Orthographic projection, section and auxiliary views, fasteners, dimensioning, axonometric projection. Six hours laboratory. Credit, 2 hours.

112 *Descriptive Geometry.* Geometry of technical drawing; brief history Prerequisite: TD 111. Six hours laboratory. Credit, 2 hours.

120 *Communication.* Composition, speech, and technical reading. Credit, 3 hours.

121 *Production Language.* Technical terms and symbols, industrial standards and tolerances, sketching and reading working drawings. Prerequisite: TD 111, or equivalent. One lecture, 3 hours laboratory. Credit, 2 hours.

160 *Technical Illustration.* Basic techniques; applications of industrial methods. Prerequisite: TD 111 or equivalent. One lecture, 3 hours laboratory. Credit, 2 hours.

200 *Machine Drafting.* Working drawings for mechanical elements. Prerequisite: TD 121 or equivalent. Six hours laboratory. Credit, 2 hours.

260 *Technical Illustration.* Continuation of TD 160; emphasis on modern commercial methods and techniques. Prerequisite: TD 160. One lecture, 3 hours laboratory. Credit, 2 hours.

302 *Technical Drawing.* Application emphasized in all fields of industrial drafting. Prerequisite: TD 111 or equivalent. Two lectures, 4 hours laboratory. Credit, 3 hours.

303 *Descriptive Geometry.* Contoured surfaces, intersections and developments; layout drawing. Prerequisite: TD 112. One lecture, 5 hours laboratory. Credit, 3 hours.

305 *Precision Design.* Layout and dimensioning for production. Use of catalogs, standards, specifications, including military. Prerequisites: TD 200, ME 230, or equivalents. One lecture, 3 hours laboratory. Credit, 2 hours.

310 *Applied Mechanics.* Forces; static and dynamic considerations. Prerequisites: PH 111, MA 121, ME 102. Credit, 3 hours.

315 *Applied Mechanics.* Strength of materials emphasis. Prerequisite: TD 310. Credit, 3 hours.

330 *Electro-Mechanical Design.* Block schematic diagrams, components and assemblies, printed circuits, and electronic equipment packaging. Prerequisites: TD 111; TE 200 or equivalents. One lecture, 3 hours laboratory. Credit, 2 hours.

340 *Fluids.* Static and dynamic properties of fluids. Flow measurement and fluid control design. Prerequisite: PH 111; TE 200 or equivalents. Credit, 3 hours.

350, 351 *Design Laboratory.* Research, design, construction; experimental laboratory projects. Prerequisite: Approval of instructor. Three hours laboratory. Credit, 1 hour.

370 *Tool Design.* Jigs and fixtures. Prerequisite: TD 200 or equivalent. One lecture, 3 hours laboratory. Credit, 2 hours.

371 *Tool Design.* Punches and dies. Prerequisite: TD 370. One lecture, 3 hours laboratory. Credit, 2 hours.

380 *Aeronautical Drawing and Design.* Numbering systems, specifications, lofting, landing gear, control systems, and aircraft control mechanisms. Prerequisite: TD 303. Six hours laboratory. Credit, 2 hours.

339 *Estimating and Cost Analysis.* Estimating printing operations and materials; elements of cost finding using Franklin and PIA Systems. Three lectures. Credit, 3 hours.

402 *Structural Detailing.* A.I.S.C. riveted and welded fabrication design. Prerequisite: TE 310, or instructor approval. One lecture, 3 hours laboratory. Credit, 2 hours.

406 *Mechanical Design.* Mechanisms, kinematics, linkage, cams, and gears. Prerequisites: TD 200, 310. Three lectures, 3 hours laboratory. Credit, 4 hours.

407 *Mechanical Design.* Strength design of machine parts. Prerequisites: TD 315, 406. Three lectures, 3 hours laboratory. Credit, 4 hours.

408 *Nomography.* Use and creation of graphs for design problems and publication. Prerequisites: TD 112; ME 102. One lecture, 3 hours laboratory. Credit, 2 hours.

450g, 451g *Design Technique.* Expression of design experience applied to integrated mechanical systems. Prerequisite: TD 407, co-requisite: TD 400. Credit, 3 hours each semester.

GRAPHIC ARTS TECHNOLOGY

GA 135 *General Graphic Arts.* Type composition, presswork, book bindings, screen processes, duplicating. One lecture, 5 hours laboratory. Credit, 3 hours.

136 *Graphic Arts Processes.* Layout and design, photo-offset lithography, photo screen processes, production techniques. One lecture, 5 hours laboratory. Credit, 3 hours.

235 *Theory of Color.* Concepts of color. Chemistry of printing inks, pigments, opacity, transparency, color mixing and matching. Credit, 3 hours.

236 *Graphic Design and Layout.* Principles of layout, design, and printing in relation to their commercial application. Preparation of roughs, working layouts, and comprehensives. Two lectures, 4 hours laboratory. Credit, 3 hours.

237 *Typography.* Typographic planning, typesetting and letterpress activity. Prerequisites: GA 135, 136. One lecture, 5 hours laboratory. Credit, 3 hours.

238 *Offset Copy Preparation.* Cold and hot type techniques. Production practices of stripping, opaquing and layout of flats. Exposing and developing of offset plates. One lecture, 5 hours laboratory. Credit, 3 hours.

333 *Offset Lithography (Presswork).* Planography and operation of the offset press. Etches, gums, solvents. One lecture, 5 hours laboratory. Credit, 3 hours.

334 *Offset Lithography (Camerawork).* Materials, methods and equipment used in the production of photographic negatives and positives for offset lithography; line and halftones. One lecture, 5 hours laboratory. Credit, 3 hours.

336 *Offset Lithography.* Methods of producing separation negatives. Prerequisite: GA 334. One lecture, 5 hours laboratory. Credit, 3 hours.

337 *Production Management.* A study of various systems used in the graphic arts industry for planning and controlling work flow. Credit, 3 hours.

338 *Graphic Arts Techniques and Processes.* Graphic arts production. Complex technology of paper, ink, and related materials with reference to printing processes. Two lectures, 4 hours laboratory. Credit, 3 hours.

435g *Plant Management.* Independent documentary research; problems in equipment and personnel selection, plant site selection and layout, and recent developments in production management. Two lectures, 4 hours laboratory. Credit, 3 hours.

436g *Technical and Research Problems.* Individual activities involving investigation, and experimentation in any technical area in the field of graphic arts. One lecture, 5 hours laboratory. Credit, 3 hours.

ELECTRONIC TECHNOLOGY

TE 200 *Electricity and Electronics.* Ohm's law; resistance; capacitance; inductance; series-, parallel-, and series-parallel circuits; with applications in electronics. Prerequisites: IA 109; 1-MA 118. Two lectures, 3 hours laboratory. Credit, 3 hours.

213 *Vacuum Tubes.* Principles, construction, operation, and applications. Prerequisites: TE 200; 1-MA 120. Two lectures, 3 hours laboratory. Credit, 3 hours.

220 *Radio Communications.* Commercial procedures and International Morse Code. One lecture, 3 hours laboratory. Credit, 2 hours.

300 *Direct Current Circuits.* Kirchhoff's laws, Thevenin's theorem, magnetic circuit, motors and generators. Prerequisite: TE 200. Two lectures, 3 hours laboratory or problem session. Credit, 3 hours.

301 *Alternating Current Circuits.* Phasors; single-phase and poly-phase systems; alternators; motors; and synchro systems. Prerequisite: TE 300. Two lectures, 3 hours laboratory or problem session. Credit, 3 hours.

315 *Vacuum Tube Circuits.* Analysis of circuits with laboratory applications to the superheterodyne circuit. Prerequisite: TE 213. Two lectures, 3 hours laboratory. Credit, 3 hours.

320 *Acoustics.* Industrial sound and noise problems; emphasis on techniques of measurement analysis. Prerequisites: TE 315, 330. Credit, 2 hours.

321 *Industrial and House Wiring.* Installation of lighting and power circuits, underwriters regulations, and cost estimation. Prerequisite: IA 220 or TE 200. Two lectures, 3 hours laboratory. Credit, 3 hours.

328 *Avionics.* Theory and functions of aero-space electronic systems. Prerequisite: TE 200 or IA 220. Credit, 3 hours.

330 *Transistors.* Physics of semiconductors, principles of diodes and transistors. Prerequisite: TE 213. Two lectures, 3 hours laboratory. Credit, 3 hours.

331 *Transistor Circuits.* Analysis of amplifiers, switching characteristics, basic computer circuits, regulated d-c power supply and inverter circuits. Prerequisite: TE 330. Two lectures, 3 hours laboratory. Credit, 3 hours.

340 *Electronic Measurements.* Application of instruments and techniques for electronic measurements. Prerequisite: TE 330. Two lectures, 3 hours laboratory. Credit, 3 hours.

400 *Circuit Analysis.* Fundamental network theorems. Prerequisite: TE 301. Credit, 3 hours.

401g *Circuit Analysis.* Complex network theorems. Prerequisite: TE 400. Credit, 3 hours.

412 *Microwaves.* Circuits, with emphasis on typical telemetry, and radar applications. Prerequisite: TE 331. Credit, 3 hours.

415g *Video Systems.* Synchronizing circuits, video amplifiers and picture tubes in systems applications. Prerequisite: TE 315 or 331. Two lectures, 3 hours laboratory. Credit, 3 hours.

418g *Communication Circuits.* Amplitude modulation, frequency modulation, television and single-sideband transmitter circuits. Prerequisite: TE 315 or 331. Two lectures, laboratory arranged. Credit, 2 or 3 hours.

419g *Communication Systems.* Continuation of TE 418 emphasizing antennas and space communications. Prerequisite: TE 418. Two lectures, laboratory arranged. Credit, 2 or 3 hours.

430g *Computer Systems.* Principles of logic circuits; binary arithmetic, counter circuits and memory circuits used in computer systems. Prerequisite: TE 331. Credit, 3 hours.

431g *Computer Systems.* Continuation of TE 430. Prerequisite: TE 430. Credit, 3 hours.

440g *Instrumentation.* Measurement and control by electronic devices of electrical or mechanical equipment. Prerequisites: TE 331, 340. Credit, 2 hours.

470g *Electronics for the Sciences.* Direct current circuits; alternating current circuits; electron tubes. Prerequisites: A non-electronic major with approval of adviser. Two lectures, 3 hours laboratory. Credit, 3 hours.

471g *Electronics for the Sciences.* Transistors; applications in instrumentation, operational amplifiers, and other electronic devices used in laboratory research. Prerequisite: TE 470 or equivalent. Two lectures, 3 hours laboratory. Credit, 3 hours.

TOOL AND MANUFACTURING TECHNOLOGY

TM 161 *Metal Processes.* Survey of machines, tools and processes; precision measurement and layout. Two lectures, 3 hours laboratory. Credit, 3 hours.

262 *Machine Tool Operations.* Engine lathe mechanical features and operations; single point tool design, cutting fluids, measurement, cutting speeds and feeds. Two lectures, 3 hours laboratory. Credit, 3 hours.

363 *Metal Processes.* Cutting, stresses, physical and thermal properties of tool and material; cutting fluids and wear rates; single point tools, milling and grinding. One lecture, 3 hours laboratory. Credit, 2 hours.

364 *Industrial Sheet Metal.* Development problems, machine emphasis, industrial applications, and estimating. One lecture, 5 hours laboratory. Credit, 3 hours.

366 *Testing and Precision Measurement.* Gaging equipment, physical dimensions, surface roughness, hardness, compression, tension, shear; destructive and non-destructive tests. Prerequisite: IA 160. Two lectures, 3 hours laboratory. Credit, 3 hours.

460 *Control Designs.* Manual through automatic controls; pressures, temperature flow and level control; control combinations and system analysis for basic pneumatic, hydraulic and electronic circuits. Two lectures, 3 hours laboratory. Credit, 3 hours.

461g *Machine Tool Operations.* Milling machines and shapers; design cutters, holding devices and typical production operations. One lecture, 5 hours laboratory. Credit, 3 hours.

462g *Production Processes.* Complex milling, shaping, grinding problems, as they apply to fabrication of industrial products. Prerequisite: TM 461g. One lecture, 5 hours laboratory. Credit, 3 hours.

463g *Manufacturing Analysis.* Economics of tooling operations; productivity of machines; tool maintenance, costs and estimating. Credit, 2 hours.

467 *Tooling Operations.* Design, construction and experimentation for quantity production. One lecture, 5 hours laboratory. Credit, 3 hours.

468 *Production Tooling.* Design, construction and operation of dies for quantity production. Prerequisite: TM 461. One lecture, 3 hours laboratory. Credit, 3 hours.

WELDING TECHNOLOGY

WT 164 *Welding Survey.* Industrial welding processes; acetylene welding and cutting; arc welding of mild steel. One lecture, 5 hours laboratory. Credit, 3 hours.

166 *Aeronautical Welding.* Chrome-molly tubing; low temperature brazing; inert gas welding of aluminum and stainless steel alloys. One lecture, 5 hours laboratory. Credit, 3 hours.

364 *Shielded Arc Welding.* Mild and alloy steels; pipe welding; oxy-acetylene cutting of pipe and structural steel. Prerequisite: WT 164. One lecture, 5 hours laboratory. Credit, 3 hours.

369 *Technical Flame Cutting and Welding.* Automatic straight-line shape-cutting, electronic tracers, multiple cutting; flame hardening and welding castings and non-ferrous metals. Prerequisite: WT 164 or 166. One lecture, 5 hours laboratory. Credit, 3 hours.

464 *Automatic Arc and Inert Gas Welding.* Submerged arc welding; automatic twin arc welding; inert gas welding of non-ferrous metals. Prerequisite: WT 364. One lecture, 5 hours laboratory. Credit, 3 hours.

466g *Welding Techniques for High Temperature Alloys.* Quality control and testing, electronic beam welding, gas tungsten arc welding of super alloys. One lecture, 5 hours laboratory. Credit, 3 hours.

468 *Metallurgy of Welded Metals.* American Welding Society's standards; ferrous, non-ferrous metals; metallurgical effects. Prerequisites: KE 320 and WT 364. Two lectures, 3 hours laboratory. Credit, 3 hours.

469g *Welding Problems.* Projection, percussion, resistance, flash and ultrasonic welding; bonding; metallizing; plasma arc welding. Two lectures, 3 hours laboratory. Credit, 3 hours.

INDUSTRIAL ARTS

IA 109 *Technical Problems.* Slide rule and applications to selected problems encountered by engineering technicians. Credit, 2 hours.

121 *Industrial Wood Processes.* Wood technology, construction and history. One lecture, 5 hours laboratory. Credit, 3 hours.

160 *General Metals.* Properties, tools and machines, welding, casting, heat treating. Two lectures, 6 hours laboratory. Credit, 4 hours.

170 *Transportation and Power.* Historical development, sources of power and the design of mechanisms for power conversion; electrical, mechanical and chemical. One lecture, 3 hours laboratory. Credit, 2 hours.

174 *Automotive Systems.* Components and their functions. Two lectures, 3 hours laboratory. Credit, 3 hours.

204 *Design.* Design principles and problems; architectural drafting. Prerequisite: TD 111. Six hours laboratory. Credit, 2 hours.

220 *Electricity.* Direct-current circuits, magnetics, alternating-current circuits and a-c motors. Prerequisite: 1-MA 118. Two lectures, 3 hours laboratory. Credit, 3 hours.

222 *Wood Technology.* Power tool operation, testing and strength of materials, laminations, industrial applications. Prerequisite: IA 121. One lecture, 5 hours laboratory. Credit, 3 hours.

273 *Automotive Electrical Equipment.* Principles, specifications, and circuitry. Two lectures, 3 hours laboratory. Credit, 3 hours.

323 *Equipment Maintenance.* School and industrial maintenance organization and operations. One lecture, 3 hours laboratory. Credit, 2 hours.

326 *Experimentation in Wood.* Modern industrial techniques, forming laminating, adhesion, bend allowances, structural design and testing. Prerequisite: IA 222. Two lectures, 4 hours laboratory. Credit, 3 hours.

327 *Finishing Materials and Techniques.* Materials origin composition and application for woods and metals. Prerequisite: IA 222. Two lectures, 4 hours laboratory. Credit, 3 hours.

342 *Selection of Subject Matter.* Selective learning units through analysis, technique and course development. Credit, 3 hours.

346 *American Industries.* Classification, origin, development, organization, materials of industry, production systems, occupations. Credit, 2 hours.

361 *Materials Laboratory.* Plastics, leather, lapidary; industrial emphasis. One lecture, 3 hours laboratory. Credit, 2 hours.

371 *Automotive Construction Materials.* Forming and shaping to measurements, finishing, styling, modern plastics and metals; electroplating, anodizing; effects of heat, wear and corrosion. Two lectures, 4 hours laboratory. Credit, 3 hours.

377 *Internal Combustion Engines.* Principles, cylinder pressures, flame temperatures, combustion phenomena; machining processes. Prerequisite: IA 174. One lecture, 5 hours laboratory. Credit, 3 hours.

401g *Drafting Procedures.* Methods, evaluation, drafting problem sequences, and equipment. Two lectures, 3 hours laboratory. Credit, 3 hours.

421g *Production Analysis.* Product and process design, jigs and fixtures, quality control, assembly, finishing. Prerequisite: IA 222. One lecture, 5 hours laboratory. Credit, 3 hours.

423g *Industrial Arts for Elementary Teachers.* Classroom problems, integrated instruction, basic skills, construction of instructional aids. One lecture 5 hours laboratory. Credit, 3 hours.

424g *Techniques of Construction.* From prints to completion; FHA standards. Two lectures, 3 hours laboratory. Credit, 3 hours.

427g *Finishing Problems.* Industrial wood and metal finishing techniques; product testing. Prerequisites: IA 222, IA 327. Two lectures, 4 hours laboratory. Credit, 3 hours.

442g *Planning and Equipment.* Concepts of planning industrial arts laboratories, auxiliary facilities, equipment selection, and arrangement. Credit, 3 hours.

443g *Safety.* Industrial accident frequency analysis, causal factors, means of reduction and prevention. Public school accident prevention and liability. Credit, 3 hours.

444g *Modern Industries.* Aspects of management, labor, plant and product; for interpretation of industry in secondary school industrial arts programs. Credit, 3 hours.

446g *Instructional Materials.* Selection, method, preparation and construction. Credit, 3 hours.

461g *Hot Metals Techniques.* Principles and applications of non-ferrous casting including sand, permanent mold, investment and low temperature alloy method; gating, sand control, pattern making. Prerequisite: IA 160. Two lectures, 4 hours laboratory. Credit, 3 hours.

465g *General Metals.* Properties of metals, spinning, wrought metal, finishing, forming, raising, project design. One lecture, 5 hours laboratory. Credit, 3 hours.

478g *Engine Analysis.* Evaluative instrumentation with reference to power, efficiencies and performance; fuels and fuel mixtures. Prerequisites: IA 174, 273 or equivalent. Two lectures, 3 hours laboratory. Credit, 3 hours.

480g *Teaching Industrial Subjects.* Teaching techniques, philosophy, organization, planning, and evaluation of teaching efficiency. Prerequisite: IA 342. Credit, 3 hours.

513 *Electronics.* Secondary school programs, courses, syllabi and laboratory projects. Credit, 3 hours.

515 *Electrical Laboratory Design.* Studies of high school laboratories for electricity and electronics; equipment, materials, instructional aids. Credit, 3 hours.

540 *Evaluation in Industrial Subjects.* Evaluative factors such as attitudes, behavioral factors, skills, technical information; instrument construction; evaluation of program effectiveness. Credit, 3 hours.

542 *Philosophy of Practical Arts.* Current concepts, anticipated policies, practices and objectives. Credit, 3 hours.

544 *History of Industrial Education.* Factors motivating evolution of modern programs; implication for future; trends. Credit, 3 hours.

546 *Technical Education.* Trends, community surveys, need, curriculums, instruction, evaluation of technical programs, financing, emphasis on 13th and 14th years. Credit, 3 hours.

548 *Administration of Industrial Education.* Improving instruction, fund and material control, student personnel problems, curricular patterns. Credit, 3 hours.

549 *Current Literature and Research.* Analysis of literature, individual investigations, development of instruments. Prerequisite: EF 500.

ZOOLOGY

PROFESSORS BENDER, CASTLE, CAZIER, COLE, HANSON, STAHNKE, WOOLF; ASSOCIATE PROFESSORS BERTKE, CLOTHIER, LANDERS, PATTERSON; ASSISTANT PROFESSORS HASBROUCK, MINCKLEY, PIKE, RASMUSSEN

DEPARTMENTAL MAJOR REQUIREMENTS—

BACHELOR OF SCIENCE DEGREE CURRICULUM

ZOOLOGY, ENTOMOLOGY—consist of a minimum of 45 semester hours of credit. Required courses are ZO 100, 240, 250, 270; ET 300; BO 100; MI 201, 202; and 18 additional hours (of which 15 must be in upper division courses). These additional hours must be chosen from at least three of the following areas of study: regulatory, environmental, developmental, genetic, systematic. The student is expected to have a basic proficiency in each of these above areas. The following supplementary courses are required: one year of a foreign language; CH 113, 115, 331, 332; PH 111, 112; MA 141, 241.

WILDLIFE BIOLOGY—consists of a minimum of 45 semester hours of credit, of which 18 must be in upper division courses. Required courses are BO 100, 170; ZO 100, 250, 270, 411, 412, 415, 425, 426, 471, 472, 473; CH 113; PH 101; MA 141; 4-AG 232, 338; 4-CE 241; one year of a foreign language.

BIOLOGY—is offered jointly with the Department of Botany. The B.S. in biology is a Liberal Arts degree for students desiring a broader education in biology than that provided by more specialized degrees in the two departments. The major consists of a minimum of 45 semester hours of credit, of which 18 must be in upper division courses (approximately 9 hours from each department). Courses BO 100; ZO 100, 240; MI 201, 202 are required. An additional 30 hours with no more than 15 from one department will be approved by the adviser in consultation with the student. These courses shall be selected so that at least three of the following six areas are represented: environmental, systematic, regulatory, genetic, molecular, and developmental biology. Supplementary courses required are CH 113, 115, 231 or 331, 332; PH 101 or 111, 112; MA 141; one year of a foreign language.

DEPARTMENTAL MAJOR TEACHING FIELD REQUIREMENTS—
BACHELOR OF ARTS IN EDUCATION DEGREE CURRICULUM

BIOLOGICAL SCIENCES—consists of a minimum of 45 semester hours of credit of which 18 must be in upper division courses. Required courses are BO 100, 170; MI 201, 202; ZO 100, 240, 311 or BO 310; BI 480. The remaining credits must be distributed equally in botany and zoology and must also include courses in the following three areas: regulatory, developmental, and environmental. One year of general chemistry is required and organic chemistry is strongly recommended.

DEPARTMENTAL GRADUATE PROGRAMS—

The Department of Zoology offers programs leading to the degrees of Master of Science and Doctor of Philosophy. Consult the Graduate Catalog for requirements.

BIOLOGY

BI 100 *The Living World.* Major biological principles as illustrated by the areas of behavior, biogeography, ecology, evolution, hygiene, morphology, physiology, reproduction and development, and taxonomy. Does not meet science requirement in pre-professional curriculum. Not open to majors in the Biological Sciences. Three lectures, 2 hours laboratory. Credit, 4 hours.

480g *Methods of Teaching Biology.* Methods of instruction, experimentation, organization, and presentation of appropriate content in biology. Prerequisites: 2-SE 311 or concurrently and 20 hours in the biological sciences. Two lectures, 2 hours laboratory. Credit, 3 hours.

ENTOMOLOGY

ET 300 *General Entomology.* Form, activities, and classification of insects. Prerequisite: ZO 100 or equivalent. Three lectures, 3 hours laboratory. Credit, 4 hours.

411g *Applied Entomology.* The recognition, economic importance, life history and habits of harmful and beneficial insects. Properties, mode of action and recommended uses of commercially important insecticides will be considered. Prerequisite: ET 300 or approval of instructor. Two lectures, 4 hours laboratory or field trips. Credit, 4 hours.

425g *Insect Bionomics.* Study and collection of insects in their natural habitats, with emphasis on ecology, life histories, and field recognition. Prerequisites: BO 100; ET 300 or approval of instructor. One lecture, 6 hours laboratory. Credit, 3 hours.

430g *Insect Morphology.* Morphology of typical insects including both external and internal structure. Prerequisite: ET 300. Two lectures, 6 hours laboratory. Credit, 4 hours.

450g *Systematic Entomology.* The classification of insects; taxonomic categories and procedures; bibliographical methods; nomenclature, museum practices. Prerequisite: ET 300. Two lectures, 6 hours laboratory. Credit, 4 hours.

460g *Insect Physiology.* Life processes of insects. Prerequisites: ET 300 and organic chemistry. Two lectures, 4 hours laboratory. Credit, 4 hours.

502 *Entomology for Teachers.* Methods of collection, recognition and preparation of insects for classroom use. Care and handling of living as well as pinned specimens. Emphasis placed on Arizona insects and their biology. Prerequisite: Ten hours in biology and/or approval of instructor. Two lectures, 3 hours laboratory. Credit, 3 hours.

550 *Insect Identification.* Detailed consideration of classification and literature of a selected order of insects with practice in identification of adult and immature forms. Prerequisites: ET 300, 450. Nine hours laboratory. Credit, 3 hours.

ZOOLOGY

ZO 100 *General Zoology.* The fundamental principles of zoology. Two lectures, one discussion, 3 hours laboratory. Credit, 4 hours.

201 *Human Anatomy-Physiology.* Consideration of the structure and dynamics of the human mechanism. Two lectures, 3 hours laboratory. Credit, 3 hours.

202 *Human Anatomy-Physiology.* Prerequisite: ZO 201 or approval of instructor. Two lectures, 3 hours laboratory. Credit, 3 hours.

203 *Heredity and Development.* The application of genetic, embryological, and physiological principles to human development. Not open to majors in medical technology or the biological sciences, pre-medical or pre-dental students. Prerequisites: CH 101, 102; ZO 201. Credit, 2 hours.

240 *Principles of Genetics.* The science of heredity and variation as determined from plants and animals. Prerequisite: BI 100 or BO 100 or ZO 100 or equivalent. Credit, 3 hours.

250 *Invertebrate Zoology.* The characteristics, life cycles, habits, economic importance, and evolution of the major groups of invertebrate animals. Prerequisite: ZO 100 or approval of instructor. Two lectures, 4 hours laboratory. One week-end field trip. Credit, 4 hours.

270 *Vertebrate Zoology.* The characteristics, life cycles, habits, economic importance and evolution of the major groups of vertebrate animals. Prerequisite: ZO 250 or approval of instructor. Two lectures, 4 hours laboratory. One week-end field trip. Credit, 4 hours.

300 *Biogenetics of Man.* Modern concepts of ecology, heredity, and evolution and their importance and influence in human affairs. Not offered for credit to majors in the biological sciences. Credit, 4 hours.

310 *Problems in Zoology.* Approval of instructor and chairman of department required. May be repeated for credit. Credit, 1-3 hours.

311 *Animal Microtechnique.* Zoological microtechnique, including the preparation for microscopic examination of animal structures, tissues, cells and whole mounts. Prerequisite: ZO 100. Six hours laboratory. Credit, 3 hours.

330 *Chordate Anatomy.* Structure, development, and homology of the chordate. Prerequisites: ZO 100; ZO 270 strongly recommended. Two lectures, 6 hours laboratory. Credit, 4 hours.

360 *Physiology.* Basic physiological functions. Prerequisites: ZO 100; CH 115. Two lectures, 3 hours laboratory. Credit, 3 hours.

400g *Poisonous Animals of Arizona.* Form, activities, and identification of venomous animals of Arizona and others thought venomous. Prerequisites: ZO 100 or equivalent and approval of instructor. Not open to majors in zoology or chemistry. Two lectures, 3 hours laboratory. Credit, 3 hours.

411g *Wildlife Management.* Principles and theory of wildlife management. Prerequisites: ZO 471, 472 or approval of instructor. Three lectures, 3 hours laboratory or field trip. Credit, 4 hours.

412g *Wildlife Management.* Emphasis on practices and techniques of wildlife management. Prerequisite: ZO 411. Two lectures, 6 hours laboratory or field trip. Credit, 4 hours.

413g *Fishery Biology.* The study of fishes and basic ecology of North American fishes, with special reference to commercial and game fishes and their life histories. Prerequisite: ZO 473 or approval of instructor. Two lectures, 6 hours laboratory or field trip. Weekend field trips required. Credit, 4 hours.

415g *Biometry.* Statistical methods applied to biological problems, including design of experiments, estimation, tests of significance, analysis of variance, regression, correlation, chi square, and bioassay. Prerequisite: MA 116 or equivalent. Two lectures, 6 hours laboratory. Credit, 4 hours.

420g *Field Zoology.* Field techniques and experience in collection and preparation of zoological specimens. Taught only in summer session; one week of preparation and four weeks in the field. Prerequisites: Minimum of 20 hours in biological sciences and approval of instructor. Credit, 6 hours.

424g *Parasitology.* The morphology, physiology, and life histories of animal parasites; therapeutics, control, and host-parasite relationships. Prerequisite: ZO 250 or approval of instructor. Three lectures, 3 hours laboratory. Credit, 4 hours.

425g *Animal Ecology.* Interrelations of animals and their environments. Prerequisites: BO 100; ZO 270. Three lectures, 3 hours laboratory or field trip. Weekend field trips. Credit, 4 hours.

426g *Limnology.* The dynamics of inland waters, stressing the interrelations of climatic, geological, topographical, physical, and chemical factors with special reference to aquatic life. Prerequisites: BO 100; CH 111; ZO 250. Two lectures, 3 hours laboratory. Credit, 3 hours.

428g *Biogeography.* Plant and animal distribution. Prerequisite: Approval of instructor. Credit, 3 hours.

430g *Embryology.* Animal development from egg to the period of extra-uterine or extra-ovular existence, including invertebrates but with the most emphasis on vertebrates. Prerequisites: ZO 100 and 330 or approval of instructor. Two lectures, 4 hours laboratory. Credit, 4 hours.

432g *Animal Cytology.* Structure and junction of the cell, based upon ultrastructural organization. Prerequisite: ZO 100. Two lectures, 4 hours laboratory. Credit, 4 hours.

433g *Animal Histology.* The microscopic study of animal tissues and their identification. Prerequisite: ZO 330 or approval of instructor. Two lectures, 4 hours laboratory. Credit, 4 hours.

441g *Cytogenetics.* The chromosomal basis of inheritance. Prerequisite: ZO 240. Two lectures, 3 hours laboratory. Credit, 3 hours.

443g *Physiological Genetics.* The nature and function of the gene. Prerequisites: ZO 240; organic chemistry. Credit, 3 hours.

445g *Organic Evolution.* Principles and theories of evolution. Prerequisites: Twelve hours of biological sciences including ZO 240 and a course in systematics. Credit, 3 hours.

460g *Vertebrate Physiology.* Vertebrate functions with emphasis on the muscular, circulatory, metabolic, and coordinative mechanisms. Prerequisites: CH 115; ZO 270 or approval of instructor. Three lectures, 3 hours laboratory. Credit, 4 hours.

461g *Comparative Invertebrate Physiology.* Comparative analysis of the general physiological processes of the invertebrate animal groups. Prerequisites: ZO 360; organic chemistry. Two lectures, 3 hours laboratory. Credit, 3 hours.

463g *Molecular Biology.* Biophysical and molecular aspects of structure, metabolism and function in cells and organisms. Prerequisite: Approval of instructor. Three lectures, 3 hours laboratory. Credit, 4 hours.

464g *Molecular Biology.* Prerequisite: ZO 463. Three lectures, 3 hours laboratory. Credit, 4 hours.

466g *Comparative Venomology.* A comparative study of the venomous animals of the world with emphasis on the venom apparatus and its secretions. Prerequisites: ZO 100; CH 231 and approval of instructor. Two lectures, 3 hours laboratory. Credit, 3 hours.

471g *Ornithology.* Natural history and field study of birds with emphasis on Arizona species. Prerequisite: ZO 270 or approval of instructor. Two lectures, 3 hours laboratory. One weekend field trip. Credit, 3 hours.

472g *Mammalogy.* The classification, structure, habits, ecology, and distribution of mammals, with emphasis on North American forms. Prerequisite: ZO 270 or approval of instructor. Two lectures, 3 hours laboratory or field trip. One weekend field trip. Credit, 3 hours.

473g *Ichthyology.* Systematics and biology of recent and extinct fishes. Prerequisites: ZO 270, 425 or approval of instructor. One lecture, 4 hours laboratory or field trip. Weekend field trip required. Credit, 3 hours.

474g *Herpetology (Amphibia).* Systematics and biology of recent and extinct reptiles and amphibians. Prerequisites: ZO 270, 425 or approval of instructor. Two lectures, 3 hours laboratory or field trip. Credit, 3 hours.

475g *Natural History of the Higher Vertebrates.* The natural history of birds and mammals, emphasizing southwestern species. Prerequisite: BI 100 or ZO 100 and approval of instructor. Three lectures, 3 hours laboratory or field trip. Credit, 4 hours.

510 *Topics in Zoology.* Detailed presentations in the following areas of zoology: Environmental; regulatory; systematic; developmental; genetic; and molecular. Prerequisites: Graduate standing and approval of instructor. May be repeated for credit. Credit, 2 hours.

515 *Populations.* The use of mathematical models in the description and analysis of populations and communities, including both genetical and ecological parameters. Prerequisites: ZO 425, 445; MA 241 or approval of instructor. Credit, 3 hours.

520 *Biology of the Desert.* The factors affecting plant and animal life in the desert regions and adaptations of the organisms to these factors. Field trips will be taken to various desert areas. Prerequisite: Ten hours of biological sciences and/or approval of instructor. Two lectures, 3 hours laboratory. Credit, 3 hours.

550 *Advanced Invertebrate Zoology.* Prerequisites: ZO 250 or equivalent and approval of instructor. Two lectures, 6 hours laboratory. One weekend field trip. Credit, 4 hours.

553 *Protozoology.* The taxonomy, morphology, reproduction, life-cycles, nutrition, growth and genetics of the protozoa. Protozoan parasites and host-parasite relationships. Prerequisite: Approval of instructor. Two lectures, 4 hours laboratory. Credit, 4 hours.

560 *Experimental Vertebrate Physiology.* Directed experiments to develop skill in the use of physiological equipment and in the handling of animals. An independent study project required. Prerequisite: Approval of instructor. One lecture, 6 hours laboratory. Credit, 3 hours.

561 *Comparative Vertebrate Physiology.* Comparative analysis of the general physiological processes of the vertebrate animal groups. Prerequisites: ZO 360 or equivalent; organic chemistry. Two lectures, 3 hours laboratory. Credit, 3 hours.

562 *Histo and Cytochemistry.* Identification and localization of compounds in tissues on a cytological scale. Prerequisites: ZO 360 or equivalent; organic chemistry. Two lectures, 4 hours laboratory. Credit, 4 hours.

565 *Advanced Parasitology.* Historical and analytical approach to the treatment of selected areas in the body of knowledge relating to parasites and parasitism. Prerequisites: MI 202; ZO 424. Credit, 3 hours.

567 *Radiation Biology.* Effects of ionizing radiations upon living cells and organisms; techniques of isotopic tracers in biology. Prerequisite: CH 225 and approval of instructor. Two lectures, 6 hours laboratory. Credit, 4 hours.

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